

USER PLANNING SERVICE

ANNUAL REPORT 1978

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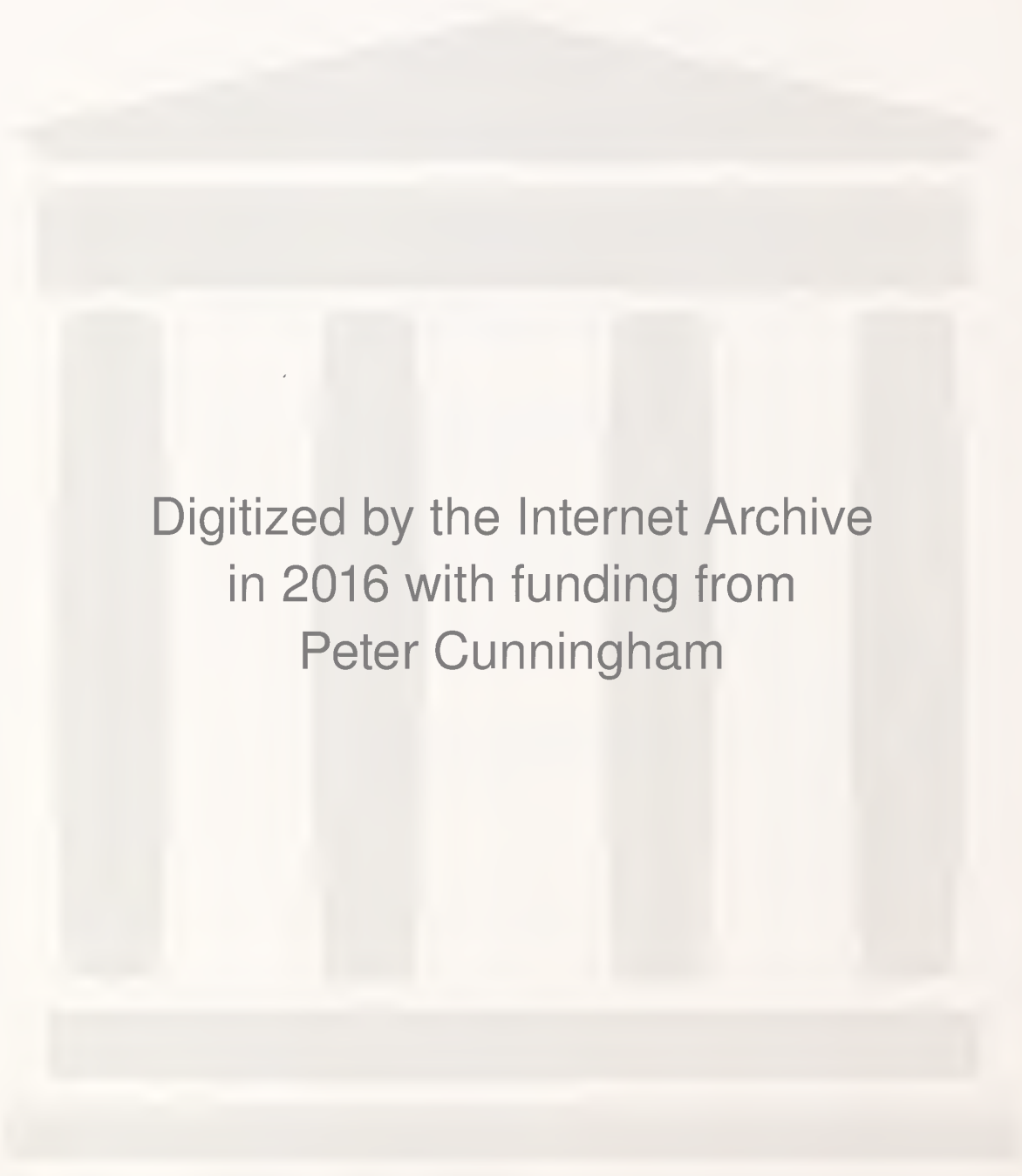
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I INTRODUCTION

I INTRODUCTION

- This report is produced by INPUT as part of the Planning Service for Computer and Communication Users. The report provides information which stems from both primary and secondary research on the information industry conducted by INPUT during 1978 and covers topics including:
 - EDP budgets and growth expectations.
 - EDP objectives, plans, and problems.
 - Significant computer and communication vendor activity during 1978.
 - Analysis of major technical issues and resulting trends.
- Information is provided for each of nine major industry sectors:
 - Discrete Manufacturing.
 - Process Manufacturing.
 - Transportation.
 - Utilities.

- Wholesale Distribution.
 - Retail Distribution.
 - Banking and Finance.
 - Insurance.
 - Services, Education, and Other.
- Nearly 500 questionnaires were completed and analyzed for this study, and included mail, telephone, and on-site contacts. Four different questionnaires were used and are included in Appendix D of this report. The majority of interviews were conducted with senior EDP managers and MIS directors, and in about 20 cases with corporate executives.
 - Earlier in 1978, existing clients and high level prospects of the User Planning Service were polled to determine research topics of greatest interest. An investigation of EDP plans and budgets was considered to be a topic of sufficient interest such that the decision was made to use the topic as the main focus of this annual report. To some extent also, this effort is an update of an earlier INPUT project (December 1976) which was a similar study conducted using data obtained from approximately 100 Fortune 500/50 companies in ten industry sectors.
 - Primary research for this report was supplemented by other INPUT research projects conducted in 1978 as part of its Market Analysis Service (MAS) and Small Establishment Service (SES) programs.
 - This report emphasizes the status of EDP departments with respect to such technological developments as distributed data processing (DDP), data base management systems (DBMS), and office automation. It is not intended to be a definitive work in describing trends in these areas, but rather to permit readers to compare their status to companies in similar industries.

- Inquiries and comments on the information presented herein are invited from clients.

II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

A. KEY CONCLUSIONS

- Among the organizations interviewed for this study, EDP budgets will grow an average of 12.4% in 1979. Little or no concern was displayed toward the possibility of worsening business conditions impacting EDP budgets and there was virtually no indication of contingency planning for a 1979 recession.
 - It should be noted, however, that the research for this study was conducted from March to September 1978, a period in which a much more bullish business outlook existed than the fourth quarter of 1978 supports.
- As anticipated, the budget "line items" related to main computers are expected to decline as a percentage through 1980, while other hardware-related items associated with small computers, programmable and non-programmable terminals, and communications are expected to increase as a percentage of the total EDP budget.

- The main reasons for the continuing increase in the installation of terminal devices have shifted during the past few years away from remote job entry and interactive timesharing to source entry and a wider range of inquiry applications.
- Personnel costs will decline as a percentage of the total EDP budget from 46% to 44% between 1978 and 1980. This expected decrease as foreseen by respondents to this study is contrary to the popular notion that personnel costs are soaring out of control. While there is more than ample evidence that the salaries and labor rates for EDP personnel are increasing and that the economics of supply and demand are driving up the "going rates," the forecasted decreases in this category are explainable in part by the following:
 - The use of outside services and software continues to grow at a rate well in excess of the overall information industry, suggesting a greater "buy" than "make" attitude.
 - Application development time is improving through the use of data base, on-line programming, structured programming, and various automated application techniques.
 - Many more "specialist" categories have evolved in both development and operations areas thereby consolidating skills and providing improved levels of efficiency.
 - With the more widespread acceptance of distributed processing, the funding for remote source data entry and other operations functions will increasingly appear in end user budgets.
- Reading between the lines, however, EDP managers have a serious set of personnel-related concerns stemming from a situation which occurs cyclically every six to eight years, namely the need to support multiple data processing environments.

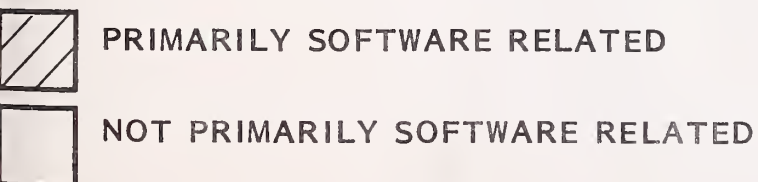
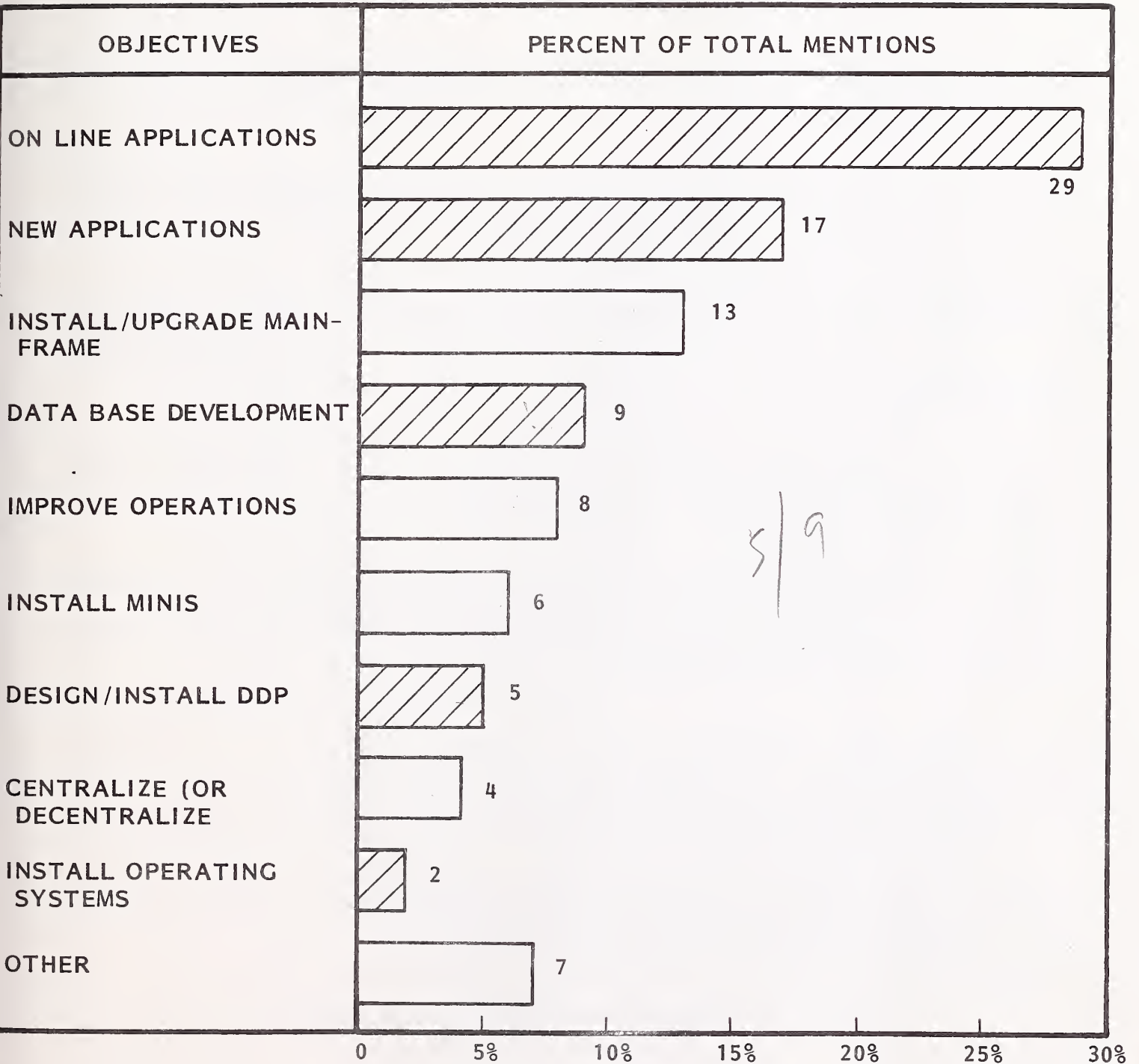
- In 1965 and 1966, EDP managers struggled to install 360s while deciding between retaining some earlier applications in "emulation mode" and converting others to run in "native mode." Also, several fundamental operational changes were prompted by the new found ability to operate multiple job streams using multiprogramming techniques.
- In 1971 and 1972, the advent of 370 systems brought a similar situation as more advanced operating systems permitted widespread ability for remote processing and the implementation of certain applications using early data base management concepts. EDP managers found themselves having to support the "old" while moving to the "new," intensifying the need for critical personnel resources.
- Again in 1978, with the first installations of 303X systems, the building of a dual environment support capability is once again taxing and frustrating EDP managers. However, the situation in this cycle is somewhat more complex.
 - The 303X is not a full-fledged, new family but rather a late life "kicker" for the 370 series. Economic decisions, therefore, must consider the availability of improved price/performance equipment in the 1980-1981 time frame.
 - Plug-compatible mainframes, with already high price/performance characteristics, were not available in earlier cycles and are adding to the decision making complexity, especially with respect to long-term residual value considerations.
 - The acceptance of data base management techniques and on-line methods together with the trend toward distributed processing add new dimensions to the implementation and continuing support aspects of the EDP organization.
 - The availability of higher speed and improved performance terminals dictates a higher level of sophistication in the communications area,

requiring improved planning and support, and possibly the introduction of value added network services.

- With these changes in progress, the single most important concern that shows through in the questioning of senior EDP management is the concern over the availability and productivity of qualified personnel, rather than concern with technical issues.
- This concern about personnel is the main driving force behind a number of other anticipated changes in EDP budgets.
 - Expenditures for outside software products, both systems and applications packages, are expected to grow by approximately 20% in 1979. This conclusion has been tested several different times and in several different ways by INPUT's research programs throughout 1978.
 - Two-thirds of study respondents indicated that they are looking for outside software products at the present time.
 - The increase in expenditures for outside training and maintenance services is expected to be in the 20-25% range for the next several years.
- 8 ● The development of on-line applications is the most highly cited EDP objective for 1979. As indicated in Exhibit II-1, this objective accounts for an average of 29% of the total mentions in all industry categories.
 - In certain industry groups such as retail distribution and services, this percentage reaches 50%.
- 9 ● It should also be noted that 1979 objectives which are primarily software oriented (shaded bars in Exhibit II-1) account for nearly two-thirds of all mentions (nearly 400 in total).

EXHIBIT II-1

1979 EDP OBJECTIVES AVERAGE FOR ALL INDUSTRY SECTORS



- 10 ● According to survey respondents, the use of programming personnel is divided almost equally between new program development and existing program maintenance. However, these statistics can be misleading.

- Discrete manufacturing indicated a 3:2 relationship in favor of new program development.
- The banking/finance and utility sectors reported an almost identical split.
- The insurance industry results showed a 2:3 relationship with existing program maintenance being higher.

- 11 ● INPUT views the latter two sectors, both of which computerized earlier and have more mature EDP systems, as indicative of a trend toward personnel distribution.

- This trend will accelerate as on-line data base management systems become imbedded in corporate business.
- The importance of this shift and its effect on the EDP organization cannot be ignored as more staff will be devoted to program maintenance and enhancement.

- 12 ● Data Base Management Systems (DBMS) are becoming an increasingly important issue at the user level where these systems are being used in application development. Current users anticipate DBMS based applications to go from 10% at present to 30% by 1981. Users want systems that are easy to use as a means of accelerating application development. Some important aspects of DBMS from INPUT research include:

- At large sites, DBMS price is relatively unimportant.

- Non-technical users are growing in importance and represent a large requirement for training.
- Less expensive communications, particularly from satellites and value added network vendors, will allow the distribution and transmission of large data bases, thereby accelerating the implementation of DDP.
- Systems and application dictionaries will become the main control tools for data and will increasingly implement privacy and security features.
- "Back-end" processors, the implementation of all or part of a DBMS in hardware, will emerge in the next few years although INPUT does not anticipate that IBM will implement this approach. It is more likely that they will incorporate DBMS processors in future mass storage devices.
- Data will increasingly merge with text and graphics, and information based management systems will emerge in the early 1980s.

13 ● To place distributed data processing in perspective, it is important to recognize that the concept's acceptance has been largely limited to the Fortune class of industrial companies and major firms in banking, insurance, and retail. Although DDP appears to have been employed by a select number of users for ten or more years, it has only been over the last two or three that widespread implementation has begun.

14 ● The current lack of communications expertise by users, particularly within smaller companies, is a major deterrent to the wider acceptance of DDP.

- Over the long-term, services such as AT&T's ACS and new offerings such as ADP's Onsite represent methods for alleviating these difficulties, especially those related to a lack of hardware and protocol standards.

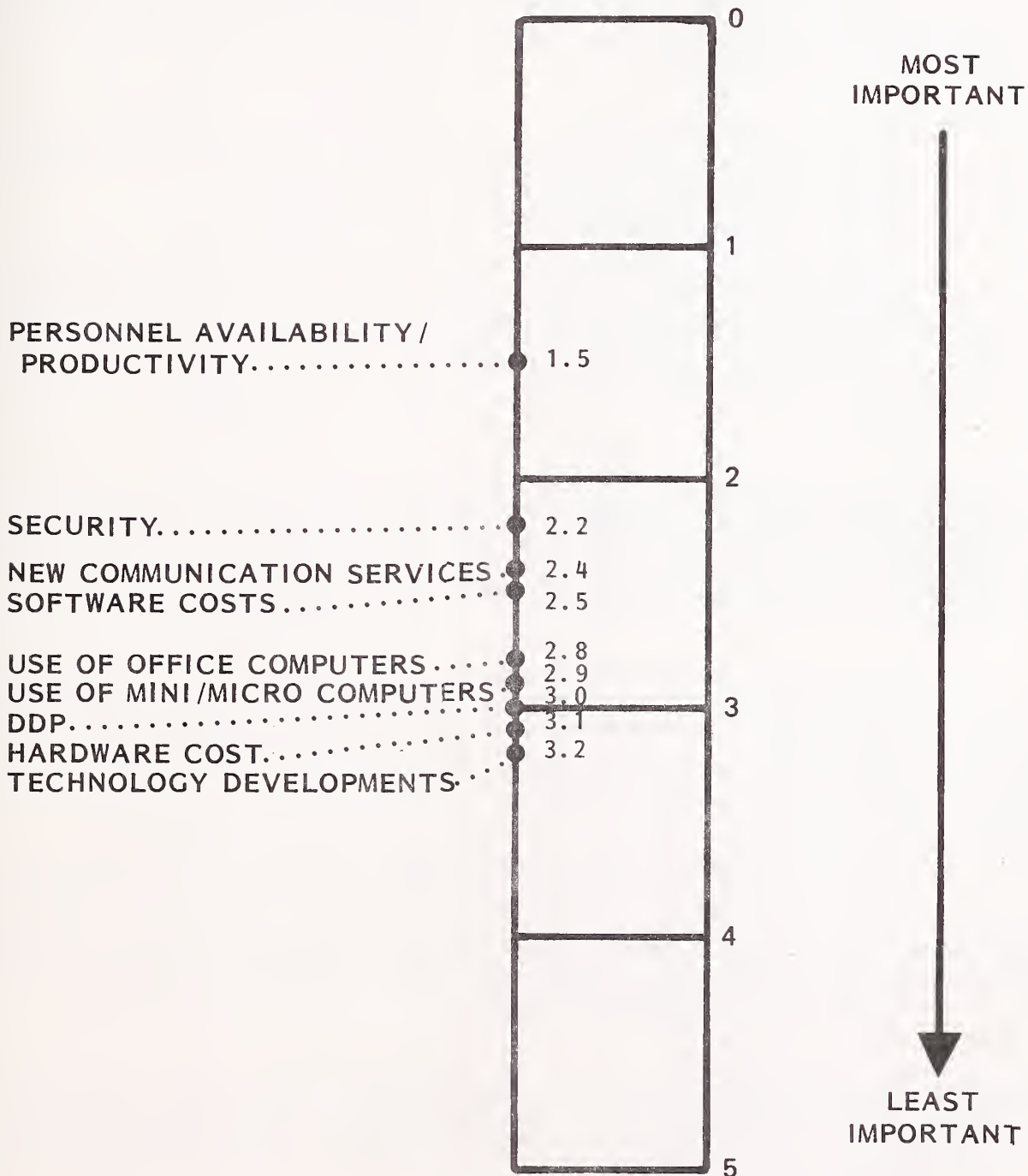
- INPUT's studies of DDP reveal a lack of hard quantitative measures among users for substantiating cost/performance benefits. Nonetheless, INPUT concludes that DDP does solve more problems than it creates and that its acceptance is growing although not at the rate suggested by the media or by vendor pronouncements.
- To summarize the relative importance of certain key EDP/communications factors, Exhibit II-2 provides a ranking of these factors as extracted from the telephone and on-site interviews conducted for this study. Respondents were asked to rank each of nine factors on a scale of 1 to 5 with 1 being most important and 5 being least important.
 - As indicated, personnel availability and productivity was considered the most important factor while hardware costs and technology developments were considered least important.

B. VENDOR OBSERVATIONS

- The year 1978 for EDP industry participants has been a period characterized by its relative stability with respect to dramatic technological announcements. Basically, at least into the last quarter of the year, EDP managers and planners have been able to focus on improved service and the continued and more thorough integration of computer and communication systems into the normal operation of their respective businesses.
- Mainframe manufacturers provided little in the way of unexpected surprises and have generally followed a pattern of gradual, orderly expansion dictated by marketing rather than technological forces.
 - The possible exception came late in 1978 in the form of IBM's 8100 which was reasonably accurately anticipated by informed industry participants.

EXHIBIT II-2

RELATIVE IMPORTANCE OF SELECTED EDP/COMMUNICATION FACTORS



- It appears that the intensifying competition in the plug-compatible mainframe arena will continue to provide, at least in the short-term, some valuable benefits to many large users as the phenomenal growth of these devices more than doubles in 1978.
 - The total of nearly 140 PCMs from Amdahl, Intel, and CDC installed at the end of 1977 will increase by at least 250 systems to over 400 by the 1978 year end.
 - The PCM vendors claims of performance, reliability, and compatibility appear to have been substantiated by current users.
 - The apparent early successes registered by initial PCM vendors have enticed new vendors such as Magnuson, Two Pi, CITEL, and Nanodata into offering even more claims of benefits and potential benefits for users.
- The current world of the highly successful minicomputer extends from the micro world of single board sets up to the powerful and versatile "super minis" offered by some of the most successful vendors in the industry.
 - 1978 was marked by a strong attempt on the part of mini manufacturers to shed their traditional OEM images and deliver products that satisfy a wide range of "total business solutions."
 - The mini market is also showing signs of growing up to provide more serious competition to traditional mainframe vendors by supporting significant software including data base management systems and full fledged communications networks.
 - The unbundling of the IBM 8100 software must also be viewed as a policy which paves the way for a wide spectrum of pricing alternatives in the future for users to evaluate.

- Arriving as a new competitive force, the microcomputer manufacturer has entered the marketplace and appears to be positioned where the mini manufacturer was some three to five years ago. However, the gap is closing fast as software, well beyond the primitive stage, and even storage and peripheral devices become available.
- As the price of mainframes drop and the numbers, types, and sizes of ancillary devices increase, the area of peripherals is becoming more significant for EDP planners.
 - Through the use of Winchester type fixed disks, there appears to be a growing trend back to non-removable storage.
 - There is currently a substantial demand for add-on bulk memory which is resulting in benefits to users through the entrance of a multiplicity of vendors.
 - The declining cost of electronics is influencing the trend in product development for a wide variety of printers, and providing a wide range of new alternatives for both large high speed devices as well as teleprinters.
- The major factor in the terminal marketplace for the next five years will be the growing improvement in and use of microcomputers in terminal systems and devices. Complementary improvements in storage technology and printing devices will further enhance the role of the terminal.
- The role of software becomes increasingly important as users devote more attention to software in an effort to control costs.
 - Based on IBM's experience with program product revenues, other hardware vendors can be expected to adopt a similar strategy.

- The need for improved cost control in the software area is also responsible for a growing list of software design methodologies such as structured design, walk-through, logical construction, and stepwise refinement.
- The number of IBM MVS users is expected to double by the end of 1979 from early 1978 in the drive to take advantage of 303X features.
- The software products market continues to be one of the fastest growing segments of the EDP industry.
 - This market is aided by the "unbundling" policy of IBM and other manufacturers who now make it easier for users to evaluate the merits of optional software.
 - Also contributing to the growth is the scarcity of experienced programmers and the rising labor rate.
- Data communications use is growing at a 20% rate and is playing a prominent role in virtually every sector of the U.S. industry. As more alternatives become available, and as the economics of these alternatives are better understood, many of the frustrations expressed by today's EDP managers and planners will disappear.
- Despite the intense pressure from in-house systems and freestanding mini-computers, the services segment of the industry is prospering and pushing forward with value added contributions and cost effective solutions.
 - INPUT believes that the ADP and NCSS minicomputer announcements of early 1978, and some others which have followed, add a new dimension to the remote computing marketplace, enhance the use of distributed computing, bring effective proven software to the mini marketplace, and afford data processing managers an opportunity to bring remote computing back under their control.

- The packaging of hardware, software, communications, and support service presages IBM's position in the 1980s.

C. RECOMMENDATIONS

- This report clearly points to a shortage of qualified systems analysts and programmers. INPUT believes that those firms who recognize this problem and take remedial action will enjoy a distinct advantage in future years.
 - Recruiting and training of EDP personnel should be established as a full-time function of the EDP department.
 - Formal programs for personnel development in the areas of data base management, communications, testing, and non-procedural languages should be established.
 - Evaluation of available training aids and courses should be made and maintained so that they can be used to the best advantage as needs arise.
- The push to on-line applications is causing significant "out of capacity" and "sluggish response" problems at peak periods. The tendency to upgrade for attaining additional capacity should be carefully reviewed.
 - Caution is urged for long-term equipment decisions being made in the next 18 months due to the high probability of change expected in the industry.
 - Offloading by means of DDP techniques should be considered where possible.

- Because peripheral devices are now a more significant cost factor in the overall hardware configuration, users must devote more attention to their selections. This is necessary because of the potential economic and performance rewards stemming from throughput, reliability, and capacity.
- The burden of maintenance is worsening as technology renders more applications feasible and consumes more personnel for the development function.
 - Lines of communication with management should be established now to anticipate system updates and facilitate their implementation at minimal cost.
 - The maintenance function must be upgraded to one of importance from one of drudgery.
 - The quality of staff assigned to maintenance must be improved. In the future this group will exert the greatest influence on equipment utilization and program productivity.
- The wide variety of terminal devices and the availability of more powerful and complex remote job entry units make the terminal selection process one which requires special care and deliberation. Furthermore, the pressures of research and development, financing, software marketing, and maintenance will result in a diminishing number of vendors in the next few years. Therefore, the stability of terminal and minicomputer suppliers should be evaluated carefully in the selection process.
- It is essential for EDP managers to control and supervise the installation of systems at remote locations which employ the DDP concept.
 - The smoothest and most error free DDP operations have resulted from added efforts to train remote site user personnel properly, and using equipment that is technically transparent to users.

- Although distributed processing may appear to offer greater local control and management of the data entry and processing functions, it does not necessarily suggest increased autonomy at the remote site. Centralized control of equipment procurement and systems development should continue at corporate or divisional headquarters.
- DDP in the future will be influenced by word processing and other office automation programs.
- As communications services are being "sold" at higher levels in the organization by AT&T, Satellite Business Systems, and now even Xerox, EDP and communications decisions in the future cannot be separated. EDP and communications managers must work more closely in evaluating, planning, and implementing systems involving both disciplines.
 - Both spheres of interest and areas of unique expertise can be brought to bear. Knowledge of remote testing, monitoring, reliability measurement, and tariffs from one area can be effectively applied to the other.
 - Traditional communications functions have now become a potential source of remote information, e.g., the intelligent PABX.
- Today's communication trends are contributing to an increase in the level of EDP involvement in office automation projects. Planners should begin now to prepare for future systems opportunities by integrating not only data but also voice and image (facsimile) into their long-range planning activities.

III CROSS INDUSTRY ANALYSIS AND ASSESSMENT OF CURRENT ISSUES

III CROSS INDUSTRY ANALYSIS AND ASSESSMENT OF CURRENT ISSUES

A. OVERVIEW

- The information industry's horizons are broadening as the traditional record-keeping uses of data processing are increasingly changed to the direct support of company operations.
- This pattern of change is reflected not only in its influence on the growing number of information industry products, but also in the demands it is placing on the professionals who make up the industry, especially those associated with the leading edge companies that are large computer/communications users.
- As cited repeatedly in this report, especially in Section IV where specific industries are analyzed with respect to EDP requirements, the need to continue supporting old environments while establishing new ones is a major source of user concern. This fundamental need can be divided into several categories:
 - A need exists to better control the timeliness of application systems and to lower the development cost of application systems.
 - A need exists to reduce the level of effort attached to the maintenance of existing systems.

- A need exists to support several modes of use including batch, transaction processing, and various forms of on-line processing, with ease of use requirements associated with each.
- Finally, a need exists for a high level of systems availability and to a lesser but growing extent high level of security.
- These needs, coupled with inflation and changing regulation, are producing many of the underlying forces resulting in new technology, new systems, new methods, and an increasing number of new and unresolved problems.
- In this section, several of these issues are analyzed together with the expectations, plans, and problems of the respondents to INPUT's research studies during 1978. These discussions are not intended to be all inclusive in terms of describing industry issues, but rather to reflect the findings with respect to what INPUT considers some of the key issues.

B. EDP/COMMUNICATIONS SPENDING

- According to most surveys on the subject, EDP/communications expenditures in the U.S. for 1978 are forecast to be between \$45 and \$47 billion. This includes more than \$8 billion which will be spent on computer services and software for the year, and reflects an overall growth of about 12.5% from 1977.

I. OUTLOOK FOR 1979

- With few exceptions, the EDP managers and executives interviewed for this study expressed little or no concern for the general economic condition, nor did it influence their planning significantly. When queried regarding their company's growth rate with respect to their industry, most selected a nominal figure or replied that they didn't know.

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- The overall attitude toward a recession in 1979 or contingency planning in the event of a severe business downturn was one of almost universal disregard.
- Responses ranged from slight concern in very few cases to "there's no way we could get along with any less."
- The growth prospects for the industry overall nonetheless do seem to hinge on whether or not the world enters a recessionary phase as we approach 1979:
 - In the steep recession of 1974/1975, U.S. shipments declined badly in 1975 and then recovered in 1976, indicating that the industry as a whole is recession sensitive, although a number of factors can mask the impact on a particular vendor's revenues.
 - The recent climb in the prime interest rates can be expected to result in a "subdued" order activity on the part of major EDP equipment vendors, if historical precedents hold.
 - The services industry on the other hand has proven to be more recession resistant based on performance during the two most recent business downturns.
- One prominent Wall Street analyst recently summarized his attitude as follows:
 - In 1979, most general purpose computer vendors may experience moderate slow downs in growth (8-9%).
 - Beyond 1979, these companies are likely to grow at only a 10% rate, less than 13-15% they experienced before the heralded 1979 recession.

- Thanks to IBM's huge mid-1978 backlog and continuing high order rates, their 1979 growth rate is likely to exceed the industry's by a wide margin.
 - In 1980, IBM's expected new product line will commence shipment, supporting an annual growth of at least 12%.
 - After 1979, the companies most likely to keep up with IBM's growth will be Burroughs and Digital Equipment.
- Other observations and opinions shared by INPUT include:
 - In the slower growth environment of 1979, computer services associated with processing (rather than software) should be able to maintain 17% revenue growth. Software products will grow at the higher rate of 22%.
 - IBM plug compatible vendors including Amdahl, Intel, and Memorex should continue with "exciting" performance through 1978 and 1979. However, beyond 1979, new IBM products and more aggressive pricing could complicate their marketing efforts.
 - Annual shipments of minicomputers and small business systems should continue at a growth rate of 25-30% through 1979, even in a slow growth environment.

2. EDP BUDGET GROWTH AND EXPENDITURES

a. Overall

- The respondents to this study support these continuing growth expectations in a variety of ways. The average expected increase in EDP expenditures from 1978 to 1979 across all industries is 12.375% (see Exhibit III-1).

EXHIBIT III-1

1978-1979 EDP BUDGET GROWTH FOR STUDY RESPONDENTS
WITH ANNUAL SALES/ASSETS IN EXCESS OF \$1 BILLION

INDUSTRY SECTOR	AVERAGE 1978 BUDGET (\$ MILLION)	EXPECTED % INCREASE	AVERAGE 1979 BUDGET (\$ MILLION)	INCREASE 1978-1979 (\$ MILLION)
DISCRETE MANUFACTURING	\$18.70	11.6 %	\$20.90	\$2.20
PROCESS MANUFACTURING	18.65	9.9	20.50	1.85
TRANSPORTATION	19.73	17.0	23.10	3.40
UTILITIES	9.00	16.0	10.40	1.40
RETAIL	3.80	10.0	4.20	0.40
BANKING AND FINANCE	5.90	14.0	6.70	0.80
INSURANCE	30.00	12.5	33.75	3.75
OTHER	12.80	8.0	13.80	1.00
AVERAGE	\$14.80	12.375%	\$16.60	\$1.80

- The transportation and utilities sectors are the fastest growing at 17% and 16% respectively.
 - The banking and insurance sectors exceed the expected average with growth forecast of 14% and 12.5% respectively.
 - The sectors with forecasts for growth at less than the overall average are discrete manufacturing (11.6%), retail distribution (10%), process manufacturing (9.9%), services and other (8.0%).
- When applied to 1978 average budgets of the largest companies (annual sales or assets exceeding \$1 billion) interviewed by INPUT for this study, these budget growth expectations produce increases ranging from a low of \$400,000 for the average retail company to a high of \$3.75 million for the average large insurance company.

b. Personnel Related

- In terms of specific budget allocations, EDP expenses for personnel in 1979 will represent 45.7% of the total budget, down slightly from 46.0% in 1978. This trend is expected to continue into 1980 at which point personnel will account for 44.1% of the total budget as shown in Exhibit III-2.
 - Two additional measures of the impact of personnel related expenditures on corporate budgets are the number of EDP employees as a percentage of total company employees, and the amount of EDP budget allocated for each employee.
- The ratio of EDP employees to total employees as reported by INPUT respondents for nine industry sectors is shown in Exhibit III-3. As indicated, these ratios tend to be lower in the larger corporations, with the exception of banking/finance and insurance where the ratios are considerably higher than in other sectors.

EXHIBIT III-2

ANTICIPATED CHANGES IN EDP BUDGETS
FOR RESPONDENTS IN ALL INDUSTRIES

BUDGET CATEGORY	% OF TOTAL EDP BUDGET			INCREASE (DECREASE) 1978-1979
	1978	1979	1980	
MAIN COMPUTERS AND RELATED DEVICES	28.0%	27.0%	25.4%	(9%)
SMALL COMPUTERS/ PROGRAMMABLE TERMINALS	3.1	4.5	5.6	81
NON-PROGRAMMABLE TERMINALS	3.3	3.4	3.7	12
COMMUNICATIONS	3.3	4.3	5.0	52
SOFTWARE (PURCHASE/LEASE)	3.6	4.1	4.3	19
PERSONNEL	46.0	45.7	44.1	(4)
OTHER	11.8	10.3	8.5	(28)

SOURCE: INPUT EDP USER PANEL

EXHIBIT III-3

NUMBER OF EDP EMPLOYEES PER 100 COMPANY EMPLOYEES

INDUSTRY SECTOR	COMPANY SIZE ANNUAL SALES OR ASSETS		
	LESS THAN \$100 MILLION	\$100-999 MILLION	MORE THAN \$1 BILLION
DISCRETE MANUFACTURING	2.3	1.6	1.0
PROCESS MANUFACTURING	1.2	1.3	1.0
TRANSPORTATION	1.4	1.2	1.3
UTILITIES	N.A.	2.9	2.1
WHOLESALE DISTRIBUTION	1.6	1.5	N.A.
RETAIL DISTRIBUTION	2.0	0.8	0.6
BANKING & FINANCE	4.2	6.2	6.2
INSURANCE	9.1	7.4	15.1
SERVICE & OTHER	2.3	1.5	1.1

- Exhibit III-4 provides a measure of the amount of EDP budget associated with each EDP employee. On average, this amount increases with the size of the company, reflecting the more advanced and sophisticated systems generally found in larger firms. Also, it more than likely reflects the higher level of staff support, training and overhead which tend to exist in larger and more widely dispersed organizations.

c. Equipment Related

- Also expected to decline as a percentage of the total EDP budget is the main computer hardware category, from 28% of the total in 1978 to 27% in 1979.
- The most dramatic increases are expected in the categories of small computers/programmable terminals and communications, each growing more than 50% during the two-year period from 1978 to 1980. These changes reflect the growing popularity of on-line applications and the emerging use of distributed data processing.

d. Services Related

- Against this growth background in the central (often the corporate) EDP area, there exists another growth component which is often misunderstood by the EDP manager, and of which he is often unaware. This is the area of computer services. INPUT observations in this regard include the following:
 - There is a clear tendency on the part of EDP managers to bring remote computing and other outside processing "in-house." These attempts have not always met with overwhelming acceptance by the end user although the tasks involved are becoming more clearly understood.

EXHIBIT III-4

EDP BUDGET DOLLARS PER EDP EMPLOYEE (\$000)

INDUSTRY SECTOR	COMPANY SIZE ANNUAL SALES OR ASSETS		
	LESS THAN \$100 MILLION	\$100-999 MILLION	MORE THAN \$1 BILLION
DISCRETE MANUFACTURING	\$32.1	\$30.9	\$44.4
PROCESS MANUFACTURING	28.2	35.0	42.5
TRANSPORTATION	31.1	29.6	59.8
UTILITIES	N.A.	36.4	48.1
WHOLESALE DISTRIBUTION	28.5	36.8	N.A.
RETAIL DISTRIBUTION	22.2	29.5	30.9
BANKING & FINANCE	36.0	30.0	39.3
INSURANCE	25.0	32.2	33.5
SERVICE & OTHER	26.3	29.8	27.5
AVERAGE	\$28.7	\$32.2	\$40.8

- End users continue to be skeptical of the internal EDP operation's ability to provide a "commercial" grade of service, and except where they are forced to come "in-house," users often opt to continue with outside vendors.
- The net result of this situation presently is a significant difference of opinion in anticipating the growth of computer services between EDP managers/planners and end users.
- Based on the analysis of INPUT's EDP User Panel survey data, almost 450 EDP managers feel that outside processing services, i.e., interactive, remote batch, and batch, will decline by about 30% in 1978 compared to 1977. However, INPUT's studies of the services industry involving thousands of end user interviews and hundreds of vendor interviews indicate that processing services will grow by nearly 19% in 1978.
- Exhibit III-5 provides the 1977 to 1978 changes across all industry sectors for the various types of outside services as forecast by EDP managers. As shown, processing services and consulting are expected to be considerably lower, while software product and maintenance expenditures are forecast to be correspondingly higher.
- Exhibit III-6 and Exhibit III-7 are taken from INPUT's 1978 Computer Services Industry Annual Report and reflect the results of end user and services vendor surveys. As shown, these exhibits reflect growth in all categories and for all industry categories.

EXHIBIT III-5

EDP MANAGERS' ESTIMATES OF
AVERAGE EXPENDITURES FOR SERVICES AND SOFTWARE
FOR ALL INDUSTRIES

TYPE OF SERVICE	1977 EXPENDITURES AVERAGE IN \$000	1978 EXPENDITURES AVERAGE IN \$000	% CHANGE 1977 VS. 1978
<u>PROCESSING SERVICES</u>			
INTERACTIVE	\$174	\$147	(16%)
REMOTE BATCH	253	156	(38)
BATCH	263	158	(40)
INPUT/OUTPUT	41	41	-
<u>SOFTWARE PRODUCTS</u>			
SYSTEMS SOFTWARE	37	44	19
APPLICATIONS SOFTWARE	43	52	21
<u>PROFESSIONAL SERVICES</u>			
CONTRACT PROGRAMMING	111	116	5
EDP CONSULTING	63	47	(25)
EDUCATION	23	28	22
OTHER	10	15	50
<u>FACILITIES MANAGEMENT</u>	123	123	-
<u>MAINTENANCE</u>	107	134	25

EXHIBIT III-6

COMPUTER SERVICES MARKET FORECASTS,
U.S. AVAILABLE REVENUES, 1977-1983

MODE OF SERVICE	\$ MILLION			AVERAGE ANNUAL GROWTH RATE
	1977	1978	1983	
REMOTE COMPUTING	\$2,198	\$2,707	\$ 6,885	21%
FACILITIES MANAGEMENT	914	1,082	2,410	17
BATCH	1,738	1,976	2,364	5
TOTAL PROCESSING	\$4,850	\$5,765	\$11,659	15%
SOFTWARE PRODUCTS				
SYSTEMS	\$ 418	\$ 508	\$ 1,280	20%
APPLICATIONS	380	473	1,235	21
TOTAL	\$ 798	\$ 981	\$ 2,515	21%
PROFESSIONAL SERVICES	\$1,187	\$1,362	\$ 2,532	13%
TOTAL	\$6,835	\$8,108	\$16,706	16%

EXHIBIT III-7

COMPUTER SERVICES MARKET FORECAST BY INDUSTRY SECTOR, 1978-1983

INDUSTRY SECTOR	MARKET FORECAST BY INDUSTRY SECTOR, 1978-1983								
	1977 (\$M)	1978 (\$M)	GROWTH 1978/ 1977 (%)	1979 (\$M)	1980 (\$M)	1981 (\$M)	1982 (\$M)	1983 (\$M)	AAGR 1983/ 1978 (%)
DISCRETE MANUFACTURING	\$ 890	\$1,047	18%	\$1,211	\$ 1,399	\$ 1,630	\$ 1,860	\$ 2,145	15%
PROCESS MANUFACTURING	510	597	17	655	782	900	1,030	1,188	15
TRANSPORTATION	169	200	18	225	266	311	360	419	16
UTILITIES	275	325	18	359	409	462	530	600	13
BANKING & FINANCE	1,130	1,638	23	1,805	2,161	2,570	2,965	3,481	16
INSURANCE	480	558	16	655	736	830	970	1,102	15
MEDICAL	430	489	14	580	659	760	885	1,021	16
EDUCATION	132	151	14	175	196	226	250	285	14
RETAIL	440	527	20	600	700	815	950	1,100	16
WHOLESALE	425	493	16	545	630	730	830	930	14
FEDERAL GOVERNMENT	860	1,015	18	1,190	1,380	1,625	1,900	2,230	17
STATE & LOCAL GOVERNMENT	265	305	15	360	415	495	570	660	17
SERVICES	306	388	27	435	533	611	715	800	16
OTHER	323	375	16	420	490	560	650	745	15
TOTAL	\$6,635	\$8,108	19%	\$9,225	\$10,756	\$12,525	\$14,465	\$16,706	17%

C. EDP PLANS AND PROBLEMS

I. PERSONNEL AVAILABILITY AND PRODUCTIVITY

- The rapidly decreasing cost of computer hardware is being complemented by increasing user demand for remote data input, processing and communications capabilities.
- The price/performance capabilities of large scale computers have tripled approximately every six years since 1954. In the twelve years from 1964 to 1976, it became possible to purchase 40 times as much on-line disk storage for the same amount of money.
- Despite the improved computer systems price/performance, expenditures for this equipment have continued to rise. With it the number and types of applications have grown, dragging along a popular misconception that data processing personnel costs are rising at an alarming rate.
 - While it is true that salary levels have been dramatically affected by inflation, total EDP expenditures for personnel, as shown earlier, are holding fast as a percentage of the total.
 - Certain industry "experts" have stated that personnel costs will represent over 90% of data processing expenditures within 20 years. INPUT believes that it is not the case and projects these costs to decline slightly as a percentage over the next decade.
 - The primary reasons for this belief are increased programmer productivity through improving applications development tools, and more direct end user involvement in application development and data entry as distributed processing systems take place.

- However, this study does support the thought that the most critical problem being faced by the EDP community is that of personnel availability and productivity. This is a central "theme" that runs throughout the survey data from the 500 responses employed in this study.
 - This problem is expressed in a variety of ways ranging from outright statements such as "not enough good programmers available" to responses such as "...need to greatly improve our training programs."
- In Section IV, the most significant EDP problems for each industry sector are quantified based on a percentage of total mentions by respondents. In Exhibit III-8, the three most significant problem areas (noted by 1, 2, and 3) from each industry sector are presented in matrix form:
 - As can be seen, the availability and productivity of personnel ranks overwhelmingly as the most significant problem.
 - Technical and operational needs generally occupy the second and third place problem categories in terms of the frequency of mentions.
- The remaining problem categories are also considered to reflect personnel-related areas of difficulty.
 - Lack of user involvement and lack of management involvement both represent shortened expressions of much more serious interpersonal relationships.
 - Quite often, the original survey data from which these statistics were obtained stated strongly that the user and/or management personnel were "unable to comprehend," or that they "meddled," or that the communication between the groups was "totally ineffective."

EXHIBIT III-8

MOST SIGNIFICANT EDP PROBLEMS

INDUSTRY SECTOR	PERSONNEL AVAILABILITY AND PRODUCTIVITY	NEED FOR OPERATIONS IMPROVEMENT (INCL. HARDWARE UPGRADE)	INADEQUATE SOFTWARE AND SYSTEMS	LACK OF USER INVOLVE- MENT IN SYSTEM/ APPL. DEVELOP.	LACK OF EFFECTIVE LONG-RANGE EDP PLANS	LACK OF MANAGEMENT INVOLVEMENT OR UNDERSTANDING	NEED FOR TRAINING AND UNDERSTANDING	INADEQUATE FUNDING OF RESOURCES
DISCRETE MANUFACTURING	1	2	3					
PROCESS MANUFACTURING		2		1	3			
TRANSPORTATION	1	2	3					
UTILITIES	1	2	3		3			
RETAIL	1	3		3	2	2		
WHOLESALE	1			3			2	
BANKING & FINANCE	1	2	3					
INSURANCE	1	3	2				3	
EDUCATION	2	1						3
OTHER	2	1			3			

NOTE: 1, 2, AND 3 REPRESENT THE FIRST, SECOND AND THIRD MOST SIGNIFICANT PROBLEM AREAS EXPRESSED BY EDP USER PANEL RESPONDENTS, RANKED BY THE NUMBER OF MENTIONS.

- The concern expressed by respondents over the shortage or total unavailability of effective training programs is still another indication of personnel-related problems.
 - Although only 20% of the EDP User Panel's 449 respondents replied to a question regarding vendors of education services, there is enough evidence to show that a reasonable number of companies which are not hardware vendors are now providing educational services.
 - Of the 81 responses given, Deltak, ASI, and Eductronics combined to provide more than 25% of the mentions as shown in Exhibit III-9.

2. APPLICATION DEVELOPMENT AND MAINTENANCE

- In analyzing the EDP/communications objectives provided by respondents, a very large percentage of the objectives mentioned (roughly 40%) involved the development of new applications and on-line applications as shown in Exhibit III-10. This compares to lower percentages given for such items as data base development, installation of mainframes and minis, operating system upgrades, improved operations, reorganization, etc.
- In support of these objectives, users are increasingly faced with decisions on how to accomplish application development most effectively. In this regard, certain background information gathered in this study provides useful planning data.
- Exhibit III-11 indicates that 15% of equipment usage and 51% of programming personnel are required for the purpose of new application development.
- Based on a \$15 million EDP/communications budget for large companies (as shown earlier in Exhibit III-1), and further assuming that about \$5 million (one-third of the total budget) is devoted to equipment costs, approximately \$750,000 annually ($15\% \times \$5,000,000$) is required for equipment costs related to new application development.

EXHIBIT III-9

LEADING VENDORS OF EDP EDUCATION SERVICES

EDUCATION VENDOR	% MENTIONS* AS PRIMARY VENDOR
IBM	57.5%
DELTAK	12.5
ASI	8.8
HONEYWELL	6.3
EDUTRONICS	5.0
BURROUGHS	2.5
ALL OTHERS	7.4
TOTAL	100.0%

*BASED ON 81 VALID CASES

SOURCE: INPUT EDP USER PANEL

EXHIBIT III-10

DEVELOPMENT OF NEW APPLICATIONS AND ON-LINE APPLICATIONS AS PERCENTAGE OF TOTAL EDP OBJECTIVES

INDUSTRY SECTOR	% OF MENTIONS BY RESPONDENTS		
	1978	1979	1980
DISCRETE MANUFACTURING	40%	37%	42%
PROCESS MANUFACTURING	37	42	36
TRANSPORTATION	35	42	67
UTILITIES	24	48	29
WHOLESALE DISTRIBUTION	36	46	44
RETAIL DISTRIBUTION	45	59	45
BANKING AND FINANCE	46	40	44
INSURANCE	47	44	38
SERVICES AND OTHER	25	50	20
AVERAGE	37%	45%	41%

EDP RESOURCE UTILIZATION

INDUSTRY SECTOR	PERCENT OF USE.				
	COMPUTER EQUIPMENT			PROGRAMMING PERSONNEL	
	PRODUC- TION JOBS	NEW APPLI- CATION DEVELOP- MENT	EXISTING PROGRAM MAINTENANCE	NEW PROGRAM DEVELOP- MENT	EXISTING PROGRAM MAINTENANCE
DISCRETE MANUFACTURING	67%	16%	13%	58%	40%
PROCESS MANUFACTURING	67	16	14	54	43
TRANSPORTATION	66	19	11	56	41
UTILITIES	67	13	10	47	48
WHOLESALE	74	14	11	50	43
RETAIL	73	14	13	56	43
BANKING & FINANCE	70	12	12	49	48
INSURANCE	73	12	14	40	58
EDUCATION	51	17	16	49	46
SERVICES & OTHER	65	13	15	50	46
AVERAGE	67%	15%	13%	51%	46%

- Similarly, if one assumes that one-half of all EDP personnel are associated with applications programming, an additional \$1.75 million of the \$15 million total budget is required for personnel expenditures associated with new applications development.
- Further, if a pro-rata share of operations and other staff personnel are added (approximately \$200,000 annually), the total cost of new applications development reaches \$2.7 million or nearly 20% of the total \$15 million EDP budget.
- In like fashion, the burden of maintaining existing systems has serious impact on both equipment and personnel. As can be seen from Exhibit III-11, the amount of equipment utilization and personnel resources needed for this function are only slightly less than the new application development function.
 - In some industries (insurance and utilities) the personnel costs for maintenance exceed those associated with new application development.
- With more than one-third of total costs already associated with application development and maintenance and coupled with growing scarcity of qualified personnel and mounting backlogs, there can be little wonder at the increasing demand for software products and their growing popularity as an alternative for holding costs and increasing productivity.

3. INCREASED USE OF PURCHASED SOFTWARE PRODUCTS

- Respondents to this study were asked several questions which were attempts to quantify the popularity of software products. One of these questions was, "Are you looking for applications software to assist in implementing or developing new applications?" Exhibit III-12 summarizes the responses to this question for over 400 respondents in ten industry sectors and shows that nearly two out of three were positive.

EXHIBIT III-12

RESPONDENTS LOOKING FOR APPLICATIONS SOFTWARE

INDUSTRY SECTOR	NUMBER OF RESPONSES	% OF RESPONSES	
		YES	NO
DISCRETE MANUFACTURING	82	63%	37%
PROCESS MANUFACTURING	72	58	42
TRANSPORTATION	14	79	21
UTILITIES	20	75	25
WHOLESALE DISTRIBUTION	18	67	33
RETAIL DISTRIBUTION	21	71	29
BANKING AND FINANCE	47	64	36
INSURANCE	57	65	35
EDUCATION	65	65	35
SERVICES AND OTHER	6	50	50
TOTAL/AVERAGE	402	65.7%	34.3%

- Another indication of this growing trend to software products is found in the analysis of methods being used to improve the time and cost associated with the development of new applications. As indicated in Exhibit III-13, purchased software products ranked second behind on-line programming in terms of the number of mentions, and is as popular as the use of project management systems and improved training combined.
- In July 1978, INPUT completed an impact report entitled "Trends in Services and Software Pricing" as part of the Market Analysis Service (MAS) program. Included in the findings of that study were several observations appropriate to firms considering the purchase of software products:
 - Seventy-two percent of the respondents who had purchased software products had experienced increases in purchase and/or annual maintenance fees. The range was from 5-25%.
 - None of the users had shifted to other software products vendors as a result of the price increase. Although they would have liked to use alternate sources, they did not feel it was feasible for them to make the shift.
 - Users did express a captive attitude toward software products they had purchased. Over half of the respondents believed they had gotten themselves "locked-in."
 - More than 95% of the users who bought software products expected purchase price and/or annual maintenance to increase by 1980, in the range from 5-25%.
- Over half of the users stated that they conducted extensive reference checking prior to selecting outside services. This reference checking was conducted among other users and professional user groups.

MOST POPULAR METHODS FOR IMPROVING TIME AND COST
OF APPLICATION DEVELOPMENT

INDUSTRY SECTOR	PERCENTAGE OF MENTIONS BY INDUSTRY SECTOR					
	ON-LINE PRO- GRAMMING	PURCHASED SOFTWARE PRODUCTS	STRUC- TURED PRO- GRAMMING METHODS	PROJECT MANAGE- MENT AND CONTROL SYSTEMS	IMPROVED TRAINING OF PERSONNEL	OTHER
DISCRETE MANUFACTURING	27%	15%	16%	17%	6%	19%
PROCESS MANUFACTURING	21	32	11	5	11	20
TRANSPORTATION	33	22	11	7	7	20
UTILITIES	28	21	10	10	4	27
WHOLESALE DISTRIBUTION	27	14	9	14	14	22
RETAIL DISTRIBUTION	18	9	18	14	5	36
BANKING AND FINANCE	16	16	12	10	14	32
INSURANCE	26	6	12	12	6	38
ALL OTHER	12	24	15	7	-	42
AVERAGE	23%	18%	13%	11%	7%	28%

- Users almost always look to the software vendors for special programs or expertise they do not possess on their own staffs. Although there is an expectation that prices will increase, there is a belief that it would still be less expensive and more timely than a comparable in-house development. Typical user comments were:
 - "Software products are cheaper and available sooner."
 - "We will continue to rely on software vendors. We can't afford to maintain staff in-house."
 - "It is too expensive to develop in-house. We cannot find qualified people."
 - "We will continue to buy and depreciate software packages."
 - "We will still use outside sources for special packages."
 - "We will continue to go to the firms who have special talent."
 - "We plan to buy on the outside because of special technical capabilities we need."
 - "It is still cheaper to use special expertise from outside. The lack of programmers is a very critical problem."
- As a measure of software product sources, Exhibit III-14 lists the top seven vendors of systems software and applications software products as provided by INPUT User Panel survey respondents.
 - As shown, the concentration of vendors of systems software is much greater with more than 75% of the mentions included in the top seven systems vendors compared to less than 60% in the applications area.

EXHIBIT III-14

LEADING SOFTWARE VENDORS TO RESPONDENTS

SYSTEM SOFTWARE VENDORS	% MENTIONS AS MAJOR VENDOR	% MENTIONS AS SECOND VENDOR
IBM	52.3%	13.4%
CINCOM	7.1	11.9
CULLINANE	7.1	3.0
ADR	3.2	9.0
PANSOPHIC	3.2	11.9
WESTINGHOUSE	3.2	4.5
WHITLOW	1.3	7.5
ALL OTHER	22.6	38.8
TOTAL	100.0%	100. %

APPLICATION SOFTWARE VENDORS	% MENTIONS AS MAJOR VENDOR	% MENTIONS AS SECOND VENDOR
IBM	18.9%	6.1%
MSA	16.8	12.1
MCCORMACK AND DODGE	6.3	6.1
AVC	5.3	3.0
WESTINGHOUSE	4.2	9.1
ISI	3.2	6.1
INSCI	3.2	3.2
ALL OTHER	42.1	54.3
TOTAL	100.0%	100.0%

- Further, IBM's percentage as a major vendor drops from 52% in the systems software category to less than 20% in the applications software category.

D. SIGNIFICANT ISSUES

- To provide a complete assessment of all of the major issues confronting the leading users of information products and services is an effort well beyond the scope of this report. Rather, the intent is to review those technical areas where major research has been conducted during 1978, primarily distributed data processing, data base management systems and to a lesser extent office automation.
 - Other areas including security, trends in peripheral devices, and value added communications, will be touched on briefly.
- Two other annual reports, the Market Analysis Service (MAS) and the Small Establishment Service (SES), are available as a part of INPUT's industry activity:
 - The MAS Annual Report on the Computer Services Industry provides an in-depth review of the processing services together with five-year forecasts by industry sector usage, services type, and services delivery mode.
 - The SES Annual Report covers the selection and use of information processing products and services by small establishments (i.e., establishments with fewer than 500 employees).

I. DISTRIBUTED DATA PROCESSING

- INPUT's DDP research in 1978 has served to underline the diverse perspectives that users have of the distributed data processing concept; i.e., the lack of a universal definition of DDP. Users have generally implemented distributed processing in a manner that is structured to satisfy their individual requirements.
- Although distributed processing suggests greater local control and management of the data entry and processing functions, it does not necessarily suggest increased DP autonomy at the remote site. Centralized control of equipment procurement and systems development will continue to be carried out at corporate or division headquarters.
- The status of DDP is determined by 200 responses from both the EDP User Panel and direct user contact for this study and shown in Exhibit III-15.
 - Fourteen percent have either implemented or are implementing DDP systems of some type. In many cases, the response indicated that these systems represent only a start toward much more widespread use of DDP.

a. DDP Network Design

- In INPUT's September 1978 Market Analysis Service study of DDP, 70% of the respondents regarded DDP network design as embodying a two level hierarchy of host and slave nodes. Only 12% of the sample were designing networks with autonomous nodes.
- In the same study, over one-half the respondents viewed DDP as a system configured around a central host computer operating with a centralized data base enabling:

EXHIBIT III-15

DDP STATUS

STATUS	NUMBER OF RESPONSES	PERCENT OF TOTAL
DDP INSTALLED	16	8%
IMPLEMENTING DDP	12	6%
CONSIDERING DDP	104	52
DDP NOT APPLICABLE	36	18
DON'T UNDERSTAND DDP	32	16
TOTAL	200	100%

- Data entry and output processing on programmable terminals.
- Remote minicomputers to split application processing with the host.
- The overall perspective did not support DDP as a network of computers with distributed data bases. This may result in large part from the lack of proven DBMS product offerings for smaller computers as well as most industries' strong orientation toward a centralized EDP organization.
- Certain industry groups, notably banking and distribution, appear to favor off-loading communications functions from the host computer as well as maintaining a centralized data base.
- Approximately one-third of all respondents mentioned IBM's System Network Architecture (SNA) as the network approach being considered or actively used for its DDP. However, 50% of the sample required IBM compatibility for their network architecture.
- Only 10% of the respondents relied exclusively on vendor supplied applications software. Fifty percent used applications software that was totally developed in-house and the remaining 40% used a combination of in-house and vendor supplied software.
- Approximately 50% of the total number of respondents were using a data base management system (DBMS) with IBM's IMS the predominantly installed package.

b. The DDP Decision Making Process

- There is little evidence to suggest that the DDP decision making process differs significantly from centralized processing analyses, justifications and procurement methods. However, there is more end user involvement in the analyses planning and specification phases.

- The decision to adopt DDP frequently evolves over an extended period of time. The causes of this evolution stem from:
 - A lack of user satisfaction with the delays and inaccuracies of centralized EDP.
 - A desire to reduce the rate of mainframe capacity utilization and decrease the incidence of upgrades.
- Approximately 50% of all respondents believed that the development cycle time for DDP was comparable to centralized processing with regard to the time required for:
 - Performing cost/performance trade-offs.
 - Defining the system.
 - Conducting the vendor analysis and selection.
 - Performing the program development, integration and debugging.
- The DDP development cycle is complicated by several factors:
 - The nature of distributed processing makes audit trail tracking more difficult and requires a longer user training period.
 - The time required to select a DDP vendor(s) varies as a function of the perceived ability of the vendor's skill in supporting remote, geographically dispersed sites, the recognition that a network architecture commitment has been made, and the size of the perceived competitive market; i.e., there are 60-90 DDP vendors.

- Minicomputer program development has proven to take longer than expected due to limitations in software and documentation difficulties.

c. Expected Versus Realized Cost Savings

- DDP is widely regarded as being a cost effective data processing alternative to more traditional methods, with almost 50% of the respondents to INPUT's Market Analysis Service study on DDP claiming actual cost savings (see Exhibit III-16).

- Users, however, were hard pressed to provide quantitative information on the amount of realized savings, payback periods or ROI.
- INPUT attributes this in part to the pilot or test status of many installations and the greater than expected difficulties encountered in implementing DDP systems.

d. Allocation Of DDP Costs

- INPUT's September 1978 DDP study showed that:

- The labor costs of non-EDP personnel who operated remote site DDP equipment were almost universally charged to the remote facility.
- Approximately two-thirds of the respondents had dedicated communications lines between host and remote facilities charged to the host site budget. The remainder had communications costs charged to the remote site or corporate communications.
- The cost of remote site equipment in two-thirds of the cases was charged directly to the remote site.
- In more than three-fourths of the case, users were also assessed a DP management overhead charge.

EXHIBIT III-16

EXPECTED VS. REALIZED COST SAVINGS
IN IMPLEMENTING DDP SYSTEMS

STATUS	TOTAL NUMBER OF RESPONSES	PERCENT OF TOTAL
NO SAVINGS ANTICIPATED OR REALIZED	1	2.5 %
SAVINGS ANTICIPATED AND NOT REALIZED	-	-
SAVINGS ANTICIPATED AND REALIZED	18	45.0
TOO EARLY TO TELL	5	12.5
DON'T KNOW	7	17.5
NO DATA	5	12.5
OTHER	4	10.0
- PAPER SAVINGS ONLY		
- TRADEOFF/BREAK EVEN		
- UNDERESTIMATED COSTS		
TOTAL	40	100.0%

e. Other Issues And Concerns

- The concept of automating the office coupled with electronic mail is generally regarded as a long-term driving force behind the growth and acceptance of DDP.
- Widespread concern was expressed over:
 - Limited communications capability of minicomputer vendors to support SDLC/SNA.
 - Ability of the telephone company (and ACS) to interface differing network standards and node requirements.
 - Need to reconcile the distribution of data with privacy and security regulations.
 - Unknowns related to Satellite Business Systems (SBS).
 - Uncertainties relating to the full cost of SNA.
 - Economics of remote sites including the availability of maintenance support.

2. DATA BASE MANAGEMENT SYSTEMS

- Data base management systems (DBMS) have emerged as one of the most important issues in the information industry, especially at the user level where these systems are increasingly being used in applications development.
- Current users of DBMS anticipate increased use in applications going from the present level of 10% to a 1981 level of 30% of installed applications. By 1983, the forecast for DBMS installations is 30 times the current level.

- INPUT expects the emergence of massive data base storage capability in the next five years.
 - Storage techniques other than rotating disks including Charged Coupled Device (CCD) and bubble technology will be used.
 - Addressing capability of 32 bits or more will become commonplace.
 - On-line storage of 100 billion bytes of information with performance better than disk will be available.
 - By mid-1980, it will be cheaper to store information in memory than on paper.
 - Word and text processing systems will have an enormous impact on DBMS as the full integration of graphics, text and data takes place.
- This massive data base capability will be used not only for very large data bases but also for myriads of small data bases.
- A requirement to convert existing applications programs to use new technology may represent the most overwhelming impediment to effective use of such technology.
- Completed in May 1978, an INPUT study on DBMS software provided a number of pertinent insights for users and potential users of DBMS. These are provided in the following paragraphs.
 - a. DBMS Product Evaluation
- More than 70% of the companies with a DBMS installed reported that they had conducted extensive analyses of DBMS products before making a final decision. This is evidence that DP managers are concerned about the impact of DBMS and carefully examine alternatives on an analytic basis before making their final decisions.

- The actual amount of analysis invested in the evaluation process does vary, however. A summary of an extensive individual analysis performed by an EDP manager interviewed for the May study is shown in Exhibit III-17.
 - This exhibit details a portion of the 54 products examined and only a few of the characteristics of each product.
 - INPUT's report entitled "DBMS: Current Products and Future Directions" prepared for the User Planning Service in July was prompted by these types of findings.
 - At the conclusion of his evaluation, the EDP manager selected none of the products listed, but rather a proprietary DBMS offered as a service by a remote computing services vendor.
- Reasons cited by the companies who did not perform extensive evaluation (less than 30%) of DBMS products were:
 - Hardware compatibility problems dictated only one or two alternatives.
 - Very few products available at the time.
 - Loyalty to their hardware manufacturer.

b. DBMS Selection

- Nearly three-quarters of respondents stated that the decision to purchase a DBMS was based on a particular application requirement. All of the applications cited required on-line capabilities.
- The problem of coordinating the evaluation of DBMS alternatives among multiple EDP installations in a large company requires particular attention.

EXHIBIT III-17

AN EDP MANAGER'S EVALUATION OF DBMS PRODUCTS

NAME OF DBMS	YEAR INTRODUCED	DDL											DML					
		SCHEMA	ACCESS			STRUCTURE						REL PTR	SR		SET			
													QL		M		PP	
													PL		RW		RW & REL	
													HPL	DBPL	RW	RW & PL	RW & REL	
ADABAS	1971	•		•	•				•			•	•		•			
DBMS 10	1973	•	•	•	•			•					•					
DMS - II	1976	•	•	•	•		•			•	•	•	•		•	•	•	
DMS 170	1976	•		•	•		•			•		•	•		•		•	
DMS 1100	1971	•	•	•	•			•					•					
DPL	1975	•	•	•					•						•			
DATA COM/DB	1971	•	•	•			•		•				•		•			•
FOCUS	1976	•	•	•			•			•		•	•		•	•	•	•
IDMS	1973	•	•	•	•			•				•	•					
IDS	1963	•	•	•	•			•					•					
IMS	1968	•	•	•			•				•	•	•					
IMAGE 3000	1974	•	•				•					•	•		•			•
INQUIRE	1969	•	•	•					•			•	•		•		•	•
MODEL 204	1971	•	•	•		•			•					•	•			
RAMIS	1967	•	•	•			•			•		•	•		•	•	•	•
SYSTEM 1022	1973	•	•	•					•				•	•	•		•	
SYSTEM 2000	1972	•		•			•		•				•		•			•
TOTAL	1970	•	•	•			•					•	•					

- One firm unknowingly purchased the same package on three separate occasions.
- An alternative to installation of a DBMS in-house is to use a DBMS in conjunction with a remote computer services (RCS) vendor.
 - Since many RCS DBMS products are proprietary and cannot be brought in-house, RCS services are often used in addition to the main in-house DBMS.
 - The new on-site hardware offerings of service companies (primarily ADP and NCSS) provide DBMS systems as an integral part of the offering, thereby reducing the serious cost differential situation that traditionally has existed between in-house and RCS alternatives in large user organizations.
- For detailed analysis of why specific products are selected, refer to INPUT's 1978 study, "Data Base Management Systems Software Markets." This report includes selection information on IMS, IDMS, TOTAL, ADABAS, SYSTEM 2000, and ADMINS.

c. Cost Allocation

- In interviews conducted during 1978, INPUT found total DBMS investments that ranged from \$35,000 to \$5 million. This included the purchase price (or lease), training, and conversion costs.
- Highest costs are experienced in IBM IMS installations:
 - Several companies stated it took a year before programmers became proficient in the use of IMS.
 - Companies able to place a dollar value on training expenses estimated from \$15,000 to \$40,000 per IMS programmer.

- The number of personnel required to support IMS ranged from three to ten times the number for other DBMS products.
- Three of every four respondents stated that they had to upgrade their hardware since installing a DBMS. However, only one-third attributed the upgrade directly to the DBMS.
- There is considerable evidence that despite vendor claims to the contrary, the level of programming personnel required to develop DBMS applications is quite high, with some unique problems associated with DBMS, such as the education and training required for programmers and users.

d. DBMS Status

- While development of DBMS has been largely evolutionary, growth is continuing and even accelerating. In this process, certain non-software developments are contributing.
 - Microcomputer technology is providing lower cost and smaller unit increments of intelligence and memory.
 - Emerging lower cost communications from value added network services (VANS) is making the distribution of data bases more economical.
 - The increasing use of electronic word processing is creating vast amounts of text in digital form.
 - The above factors are combining with the trend to distributed data processing.

- In section IV of this report, a detailed presentation of the status of DBMS installations is provided for each industry sector. Discrete manufacturing and banking have the highest frequency of DBMS use, and the transportation sector has the lowest percentage of installations.
- The next few years will see further emphasis on distributed data bases using full DBMS with increasing autonomy of each distributed location with respect to the management and manipulation of its own data. However, there will still be a requirement for central control of the various data base nodes and for consolidation of these various data bases into a high level, centralized, organizational data base.
- Both of these factors will tend to increase DBMS market size and will produce new techniques for pricing and supporting the products and applications.
- This growth also brings with it new methodology, such as the "back-end" DBMS processor for which INPUT projects a \$200 million to \$300 million market by 1983.

3. OFFICE AUTOMATION

- Office automation covers many aspects of the processing, verification, storage and retrieval, and transmission of information. Quite often the use of word processing equipment is analyzed as the bellwether progress in this area, so far as its penetration into the traditional EDP environment is concerned.
- The majority of INPUT's research in the office automation area in 1978 has been conducted in conjunction with the Small Establishment Service (SES) program.
- INPUT did solicit information on the involvement of EDP managers in office of the future functions. A summary of the current level of participation (1978) is shown in Exhibit III-18.

EXHIBIT III-18

PERCENT OF RESPONDENTS CURRENTLY INVOLVED WITH SYSTEMS AND PROGRAMS
RELATED TO THE OFFICE OF THE FUTURE

INDUSTRY SECTOR	ELEC- TRONIC MAIL	WORD PRO- CESSING	COPYING DUP- LICATING	DATA COMMUNI- CATION	VOICE COMMUNI- CATION	FAC- SIMILE	VIDEO CONFER- ENCE
DISCRETE MANUFACTURING	23%	35%	23%	91%	21%	28%	5%
PROCESS MANUFACTURING	17	33	22	88	30	51	6
TRANSPORTATION	0	22	37	100	50	25	12
UTILITIES	0	67	33	100	11	25	0
WHOLESALE DISTRIBUTION	11	25	22	94	11	25	0
RETAIL DISTRIBUTION	0	20	29	82	33	21	0
BANKING AND FINANCE	12	42	33	94	34	31	0
INSURANCE	8	42	23	63	4	12	0
EDUCATION	15	47	24	88	7	10	3
SERVICE AND OTHER	0	100	50	100	50	50	0
OVERALL	14%	39%	26%	88%	20%	27%	3%

- Data communications, as expected, is by far the most advanced area with respect to the level of involvement with an average of 88%. This is expected to increase to virtually 100% by 1983.
- Word processing, with an overall average level of 39% at present, will also grow significantly by 1983 to an expected two-thirds. At present, transportation, retail and wholesale lag behind in this area, while utility companies indicated a 67% level of involvement.
- Electronic mail projects have begun in only one-half of the industry sectors and appear to be further along in manufacturing than elsewhere. The overall 14% level is forecast to improve to at least 50% by 1983.
- Video conferencing has currently not produced a high level of interest, nor will it in the next three to five years.

4. OTHER ISSUES

- Two significant areas which were ranked by respondents as important computer/communications considerations are security and new communication services.
- Several communications-related studies/reports have been completed by INPUT or are in progress at the present time:
 - An in-depth multi-client study on value added networks involving approximately 200 interviews was released during the first quarter of 1978.
 - In October, INPUT produced a Vendor Watch Report entitled "AT&T's ACS: A Promise of a Threat" which analyzed key aspects of the proposed new service.

- During the fourth quarter of 1978, an impact study is being prepared to analyze the economic considerations associated with major network implementation strategies. This report which reviews SNA, VANs, and a variety of other communications strategies is expected to be completed in late December as part of the 1978 User Planning Service.
- INPUT has not conducted any major research projects for its clients on the topic of security in 1978. As parts of other studies however, this subject has been examined as it applies to certain technologocial developments:
 - With respect to security features in Value Added Network Services, users felt that the features were important but expressed an unwillingness to pay a premium for the capability.
 - INPUT is aware of the growing availability of security related services such as recovery operation centers, backup facilities, and physical security consulting services. These topics were not introduced in any part of this study.

IV INDUSTRY SECTOR ANALYSIS

IV INDUSTRY SECTOR ANALYSIS

- In this section, separate reports are provided for nine industry sectors, with each subsection organized into four parts:
 - An industry sector overview containing an EDP profile of the respondents to the study for that sector together with other points of general interest.
 - A quantitative budget and expenditure forecast analysis.
 - A summary of EDP plans which ranks objectives, major problems, significant EDP factors, and analyzes the current use of equipment and certain personnel resources.
 - A review of the industry sector's status with regard to selected 1978 issues including distributed data processing, data base management systems, and office automation.
- The nine industry segments included in the chapter are as follows:
 - A. Discrete Manufacturing.
 - B. Process Manufacturing

- C. Transportation
 - D. Utilities
 - E. Wholesale Distribution.
 - F. Retail Distribution.
 - G. Banking and Finance.
 - H. Insurance.
 - I. Service and Other.
- The demographic data included in each section is taken from a number of sources including various government publications and earlier INPUT studies. Appendix B contains additional demographic data for each industry sector analyzed.
 - Several references in this chapter are made to changes in EDP objectives and to changes in significant problems since 1976. These observations are based, in part, on research conducted for the January 1977 study by INPUT entitled "EDP Plans and Budgets for 1977."
 - It should be understood that a significant number of firms responding to this study survey indicated that they were in the \$100 million or less annual sales size range. Subsequent analysis showed that many of these were divisions or subsidiaries of larger firms.
 - It is not known how their EDP/communications activities are impacted by parent company dictates.
 - Should more insight be required into the inter-relationships between branches/subsidiaries and parent companies with respect to information

products/services, their use, application, and associated planning, readers are urged to refer to INPUT's Small Establishment Services (SES) program. Extensive research has been completed on these topics during 1978 and six different reports have been published.

A. DISCRETE MANUFACTURING

A. DISCRETE MANUFACTURING

I. INDUSTRY SECTOR OVERVIEW

- The discrete manufacturing sector, with more than 185,000 U.S. establishments and nearly 200 firms with over \$300 million in annual revenues, employs 11 million employees:
 - Total expenditures for EDP by this sector exceeded \$8.5 billion in 1977 and are expected to grow beyond \$15 billion by as early as 1982.
- Paced by industry giants including automobile, aerospace, and machinery manufacturers, the industry's growth has been exceptional in 1977 and 1978. Survey results indicate a highly positive outlook for 1979 with the majority of respondents indicating that their individual company growth will exceed overall industry growth.
- In rating the importance of EDP in accomplishing this growth, almost all respondents indicated that EDP was required or essential but of medium (rather than major or minor) importance. Specific exceptions, however, were provided by several companies with respect to the role of EDP in product development and engineering where computers do provide a perceived competitive advantage.
- Top management concerns still appear to focus on the costs associated with information systems although cost reductions are becoming less important. EDP budget plans generally have been met in 1978 with only one indication of actual performance being significantly higher than plan.
- With respect to questioning regarding contingency plans in the event of a 1979 recession, not one response provided an indication that 1979 plans included a specific allowance for this eventuality.

- The discrete manufacturing sector yielded 97 responses, about 19% of the total, for this report. The contributing industry groups included companies with SIC codes in the 23, 25, 27, 31, and 34 through 39 categories.
 - More than 50% of the responses came from companies in the machinery groups including electrical (SIC 35 and 36) and transportation equipment (SIC 37).
 - Another 25% of the responses came from companies in printing and publishing (SIC 27), fabricated metal products (SIC 34), and instruments (SIC 38).
- Exhibit IV-1 provides a profile summary of EDP User Panel respondents in the discrete manufacturing sector for companies in three different size categories:
 - One-third of the companies reported annual sales of less than \$100 million with a range of \$28 million to \$81 million, and averaging \$59 million. This average company employs 1,240 personnel of which 28 (2.3%) are EDP personnel, and has an annual EDP budget of \$900,000 (1.5% of annual sales) which translates to \$32,100 per EDP employee or about \$700 per total company employee.
 - More than one half (56%) of the respondents ranged in size from \$100 million to \$1 billion in annual sales. The average company in this category is \$231 million in size, employs 4,260 people of which 68 (1.6%) are involved in EDP, and has an EDP budget of \$2.1 million which represents .9% of the company's annual sales.
 - The largest discrete manufacturing companies responding to INPUT's survey average \$3.7 billion in annual sales, and employ an average of 421 EDP personnel or about 1% of the total 40,000 employees. These companies reported EDP budgets which average \$18.7 million or about .5% of total company sales.

EXHIBIT IV-1

RESPONDENT PROFILE - DISCRETE MANUFACTURING SECTOR

PROFILE CHARACTERISTIC	COMPANY SIZE IN TERMS OF ANNUAL SALES/REVENUES		
	LESS THAN \$100 MILLION	\$100-999 MILLION	MORE THAN \$1000 MILLION
PERCENT OF RESPONDENTS	33%	56%	11%
AVERAGE ANNUAL SALES	\$59.2M	\$231M	\$3,680M
AVERAGE TOTAL EMPLOYEES	1,240	4,260	40,600
AVERAGE EDP EMPLOYEES	28	68	421
EDP EMPLOYEES PER 100 TOTAL EMPLOYEES	2.3	1.6	1.0
AVERAGE EDP BUDGET	\$0.9M	\$2.1M	\$18.7M
EDP BUDGET % OF ANNUAL SALES	1.5%	0.9%	0.5%
EDP BUDGET PER EDP EMPLOYEE	\$32.1K	\$30.9K	\$44.4K
EDP BUDGET PER TOTAL EMPLOYEE	\$700	\$490	\$460

- Additional observations from Exhibit IV-1 include:
 - Economies of scale are achieved by larger firms in this sector both in terms of the lower ratio of EDP employees to total company employees and the lower ratio of EDP budget to total company sales.
 - These improvements suggest a measure of the economic value associated with centralized EDP operation, in that many of the smaller firms included in this analysis are known to be subsidiaries or autonomous divisions of larger companies.
 - The EDP budget per EDP employee ratio of \$44,400 for the largest respondents is thought primarily to reflect the greater investment needed by large diverse companies for huge complex systems including communications, software and remote hardware, and also the currently high amounts required for conversion and migration to new hardware and software systems.
- Exhibit IV-2 provides a measure of the range of values for the ratio of EDP budget to total company sales reported by discrete manufacturing respondents. The mean value for the industry is 1.24% compared to 1.27% for respondents across all industries.

2. BUDGET AND EXPENDITURE ANALYSIS

- EDP expenditures in the discrete manufacturing sector will increase an average of 11.6% in 1979, according to respondents, and will continue at a slightly higher rate through 1983. Exhibit IV-3 shows the distribution of their planned budget growth for the 1978 to 1979 period.
- As a percentage of the total EDP budget, expenditures for small computers, terminals, communication services and software will all increase in 1979, while expenditures for large mainframe computers and other (supplies, forms, etc.) expenditures each decline by two percentage points. The general

EXHIBIT IV-2

DISTRIBUTION OF EDP BUDGET TO COMPANY SALES RATIOS FOR RESPONDENTS IN THE DISCRETE MANUFACTURING SECTOR

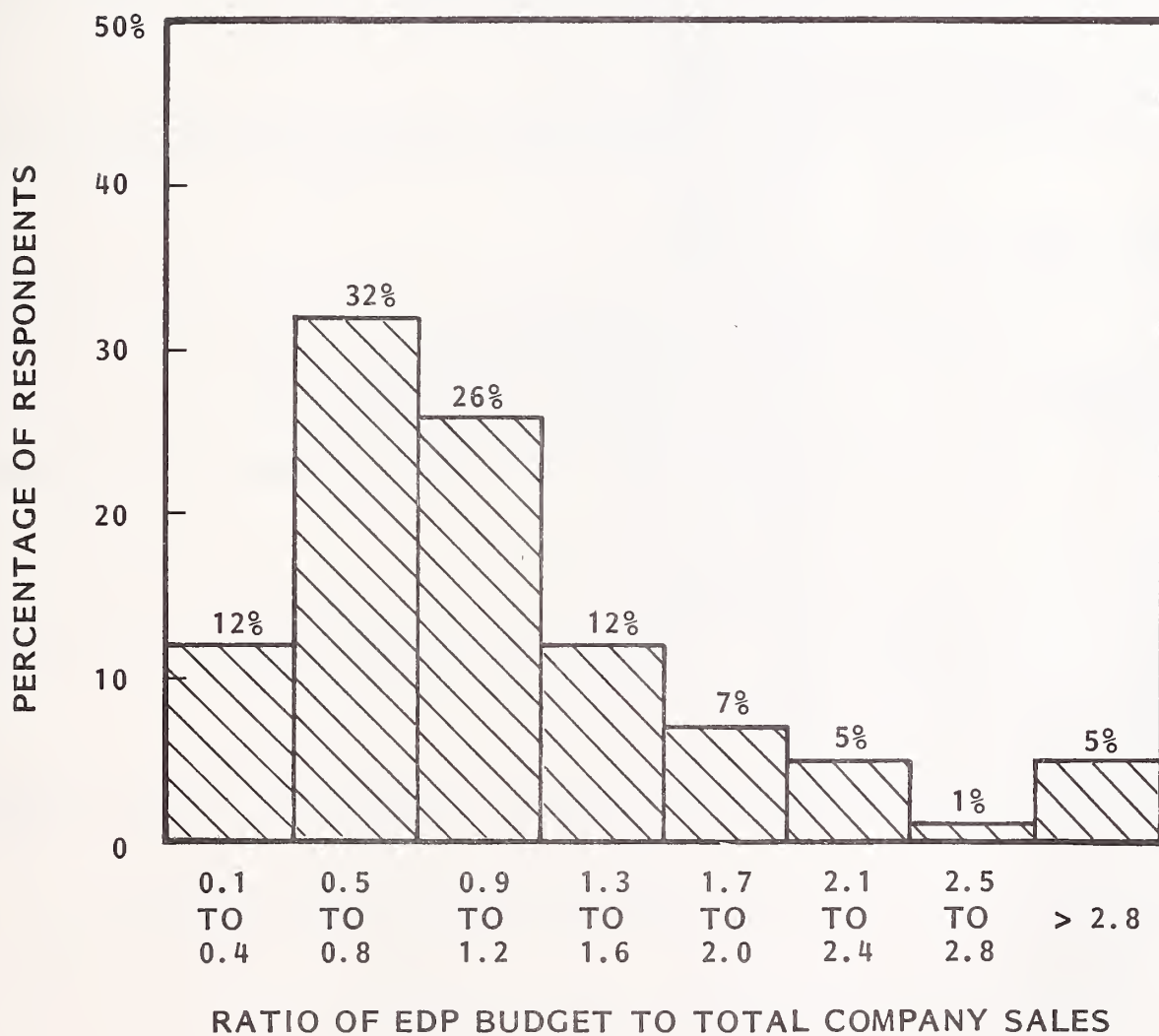
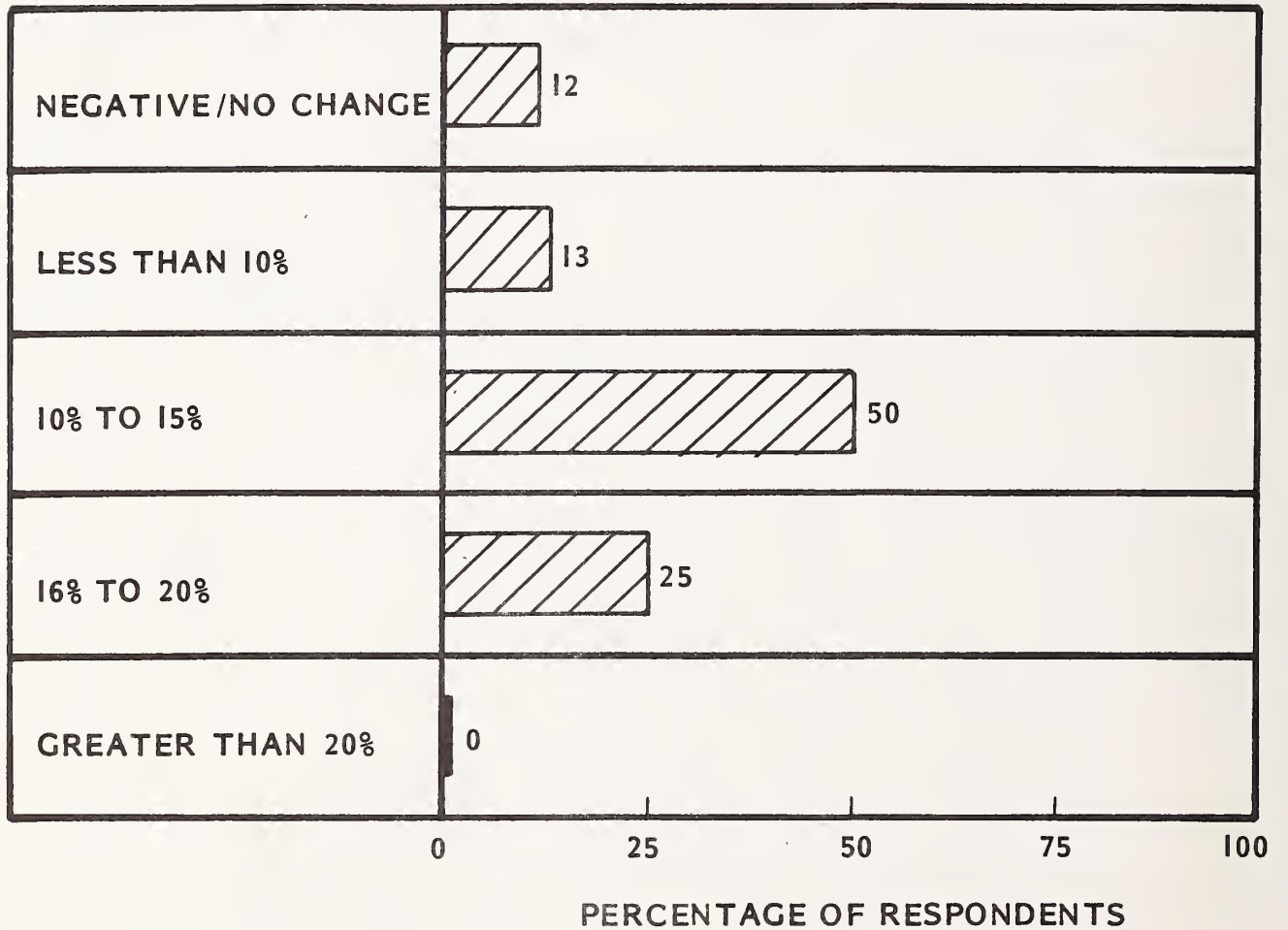


EXHIBIT IV-3

1978-1979 PLANNED EDP BUDGET GROWTH FOR RESPONDENTS - DISCRETE MANUFACTURING SECTOR



indication is that this trend will continue through 1980 as indicated in Exhibit IV-4. Personnel costs as a percentage of the total are expected to remain constant over the two-year period.

- It should be noted that based on the expected 11.6% budget increase in 1979, the absolute dollar expenditure in every category will be higher although slight in the mainframe and miscellaneous other categories.
- Despite the significant declines in processing services envisioned by EDP managers shown in Exhibit IV-5, discrete manufacturing is still a major user of computer services. As indicated, significant increases are expected for 1978 in the areas of software products, education, and maintenance, reflecting the general trend observed in earlier INPUT studies.
 - It should be noted that the expected declines in processing services expenditures represent significant differences from previous INPUT forecasts. It is INPUT's belief that the control of most outside services purchases is not usually vested in the central EDP department (the source of most data contained in this report).
 - While there is movement toward bringing remote computing services "in-house" which results in reduction in the expenditures for outside services under EDP department control, there is still a significant increase in end user expenditure taking place as evidenced by other INPUT studies.
 - As part of its 1978 study of the services industry, INPUT forecasts for discrete manufacturing show 1977 to 1978 increases of 20% for remote computer services, 16% in batch services, 23% in software products, 11% in professional services, and 18% overall.

EXHIBIT IV-4

ANTICIPATED CHANGES IN EDP BUDGETS FOR RESPONDENTS IN THE DISCRETE MANUFACTURING SECTOR

BUDGET CATEGORY	% OF TOTAL EDP BUDGET			INCREASE (DECR.) 1978 TO 1980
	1978	1979	1980	
MAIN COMPUTERS	27%	25%	23%	(15)%
SMALL COMPUTERS/ PROGRAMMABLE TERMINALS	3	5	6	100
NON-PROGRAMMABLE TERMINALS	3	4	4	33
COMMUNICATIONS	5	6	6	20
SOFTWARE (PURCHASE/LEASE)	3	4	4	33
PERSONNEL	45	45	45	0
OTHER	13	11	9	(31)

EXHIBIT IV-5

AVERAGE EXPENDITURES FOR SERVICES AND SOFTWARE IN THE
DISCRETE MANUFACTURING SECTOR

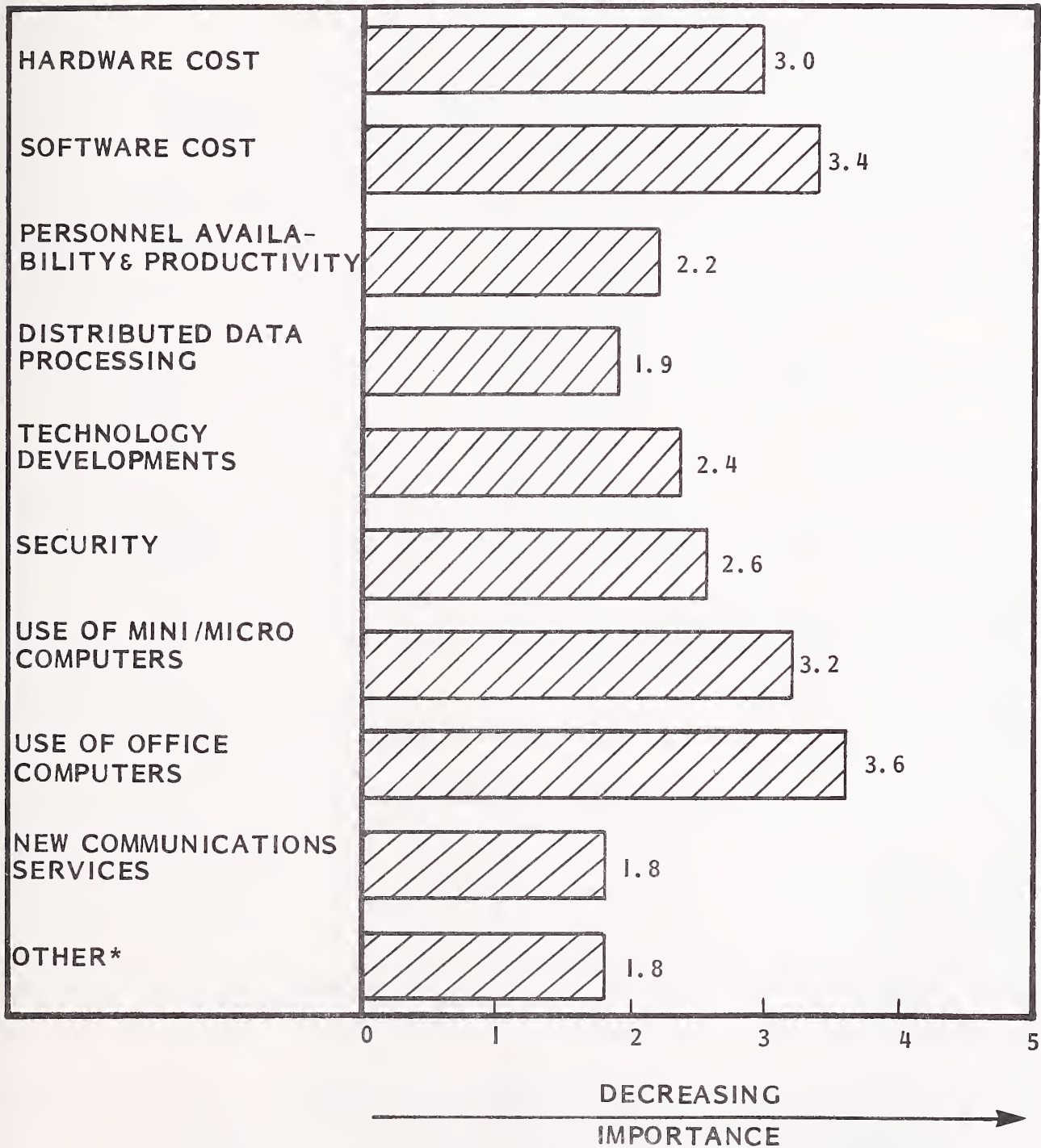
TYPE OF SERVICE	1977 EXPENDI- TURES AVERAGE IN \$000	1978 EXPENDI- TURES AVERAGE IN \$000	PERCENT CHANGE 1977 VS. 1978
<u>PROCESSING SERVICES</u>			
INTERACTIVE	\$473	\$330	(30)%
REMOTE BATCH	687	277	(60)
BATCH	674	301	(55)
INPUT/OUTPUT	33	34	3
<u>SOFTWARE PRODUCTS</u>			
SYSTEMS SOFTWARE	\$ 38	\$ 45	18 %
APPLICS. SOFTWARE	42	55	31
<u>PROFESSIONAL SERVICES</u>			
CONTR. PROGRAMMING	\$303	\$284	(6)%
EDP CONSULTING	167	95	(43)
EDUCATION	42	53	26
OTHER	0	6	+
<u>FACILITIES MANAGEMENT</u>	\$ 6	-	-
<u>MAINTENANCE</u>	\$ 65	\$ 89	37 %

3. MAJOR PLANS AND PROBLEMS

- Study respondents who were visited or contacted by telephone were asked to rank the importance of certain EDP/communications factors. In every industry sector, this ranking reflected major concern over personnel availability and productivity and at least one area of technology implementation. Relatively low emphasis was placed on hardware and software cost.
- Exhibit IV-6 provides a measure of the relative importance of these factors from discrete manufacturing respondents.
- All study respondents were asked to provide an indication of their highest priority EDP objectives for 1978, 1979, and 1980. Exhibit IV-7 summarizes these objectives by providing a quantitative ranking (based on the number of respondent mentions) for several major categories.
 - New application development and on-line application development remained high level objectives through 1980 accounting for 40% of all mentions.
 - Hardware and software migration, while relatively high in importance in 1978, taper off by 1980 as major objectives.
 - The implementation of data base and distributed data processing systems triple as a combined percentage of mention from 1978 to 1980.
- Exhibit IV-8 provides an indication of the applications being planned and developed by the discrete manufacturing sector, together with an indication of which applications are considered to be of highest priority.
 - Other than the industry specific applications, accounting/finance and order entry applications received the most mentions.

EXHIBIT IV-6

IMPORTANCE OF EDP/COMMUNICATION FACTORS RANKED BY RESPONDENTS IN THE DISCRETE MANUFACTURING SECTOR



*SPECIFIC FACTORS MENTIONED INCLUDE:

- EDP ORGANIZATION
- VENDOR SERVICE

EXHIBIT IV-7

EDP OBJECTIVES FOR RESPONDENTS IN THE DISCRETE MANUFACTURING SECTOR

OBJECTIVE	PERCENT OF MENTIONS		
	1978	1979	1980
DATA BASE DEVELOPMENT	7%	14%	12%
DESIGN/INSTALL DDP	2	8	18
NEW APPLICATIONS	23	21	20
ON-LINE APPLICATIONS	17	16	22
INSTALL/UPGRADE MAINFRAME	15	14	2
INSTALL MINIS	5	5	2
INSTALL OPERATING SYSTEM	11	3	4
IMPROVE OPERATIONS	18	11	8
CENTRALIZE (OR DECENTRALIZE)	2	4	2
OTHER*	-	4	10
	100%	100%	100%
TOTAL MENTIONS	83	74	50

*SPECIFIC RESPONSES INCLUDE:

- International Communications
- Office of the Future

EXHIBIT IV-8

APPLICATIONS TO BE DEVELOPED BY RESPONDENTS IN THE DISCRETE MANUFACTURING SECTOR

APPLICATION	PERCENT OF MENTIONS	% OF MENTIONS AS HIGHEST PRIORITY
ACCOUNTING/FINANCE	18%	11%
COST SYSTEMS	5	5
INVENTORY CONTROL	9	10
ORDER ENTRY/BILLING	14	24
PERSONNEL/PAYROLL	7	3
PURCHASING	6	5
MARKETING/SALES	5	5
MODELING/FORECASTING	3	0
COMMUNICATIONS	0	0
GRAPHICS	1	0
SCIENTIFIC/ENGINEERING	0	0
DATA BASE	3	0
ELECTRONIC MAIL	3	0
WORD PROCESSING	1	0
PERFORMANCE MEASUREMENT	1	2
OTHER* (INDUSTRY SPECIFIC)	24	35
TOTAL	100%	100%

*SPECIFIC APPLICATIONS INCLUDE:

- Manufacturing
- Scheduling
- Distribution

- Order entry was given as the highest priority development 24% of the time it was mentioned.
- Financial and administrative applications received 60% of the total mentions.
- Personnel availability and productivity are considered to be the most significant problems in the discrete manufacturing sector, as shown in Exhibit IV-9. This is consistent with the responses generated by other industry sectors and is a recurring problem area throughout this report.
- The burden of maintaining existing EDP systems is having a dramatic impact on the use of resources, and on the planning for both equipment and personnel. Exhibit IV-10 summarizes the reported use of resources by respondents in the discrete manufacturing sector.
 - Two thirds of the equipment utilization is devoted to production. The remaining time is almost equally divided between new application development and existing program maintenance. Assuming a 75% equipment utilization factor, this translates to approximately 20 hours per week per machine devoted to application maintenance tasks.
 - Similarly, nearly one-half of all application programmer time is devoted to the maintenance function, a difficult environment in which to reduce personnel turnover and induce a high level of motivation.
- Exhibit IV-11 provides a list and a ranking of the most popular methods being used to reduce or improve the time and cost associated with the development of new applications.
 - Both on-line programming and the purchase of software products receive a high percentage of mentions, consistent with other industries.

EXHIBIT IV-9

MOST SIGNIFICANT EDP PROBLEMS BY RESPONDENTS IN THE DISCRETE MANUFACTURING SECTOR

ITEM	% OF MENTIONS
PERSONNEL AVAILABILITY AND PRODUCTIVITY	19%
NEED FOR OPERATIONS IMPROVEMENT (INCLUDING HARDWARE UPGRADE)	14
INADEQUATE SOFTWARE AND SYSTEMS	10
LACK OF SUFFICIENT OR CONSISTENT EDP PLAN	9
INADEQUATE STANDARDS, PROCEDURES, AND DOCUMENTATION	9
LACK OF MANAGEMENT PARTICIPATION OR UNDERSTANDING	8
OTHER	31
<ul style="list-style-type: none"> - NEED FOR USER INVOLVEMENT AND TRAINING - INSUFFICIENT COMMUNICATIONS CAPABILITY - NEED FOR PROJECT CONTROL SYSTEMS - INADEQUATE ORGANIZATION - HARDWARE AND SOFTWARE CONVERSION - NEED FOR FASTER APPLICATION DEVELOPMENT TIME - INCREASING MAINTENANCE REQUIREMENTS - LACK OF DBMS 	

EXHIBIT IV-10

USE OF RESOURCES - DISCRETE MANUFACTURING SECTOR

RESOURCE UTILIZATION CATEGORIES	RESPONDENT AVERAGE
<ul style="list-style-type: none"> ● COMPUTER EQUIPMENT: <ul style="list-style-type: none"> - PRODUCTION RUNS - NEW APPLICATION DEVELOPMENT - EXISTING PROGRAM MAINTENANCE - OTHER¹ 	67% 16 13 4 <hr/> 100%
<ul style="list-style-type: none"> ● APPLICATION PROGRAMMING PERSONNEL: <ul style="list-style-type: none"> - NEW PROGRAM DEVELOPMENT - EXISTING PROGRAM MAINTENANCE - OTHER² 	58% 40 2 <hr/> 100%

OTHER MENTIONS INCLUDE:

¹ OUTSIDE SALES
RERUNS
ADMINISTRATIVE
EXCESS TIME
OPERATING SYSTEM

² USER SUPPORT
DATA BASE
SELF-IMPROVEMENT
OPERATING SYSTEM

EXHIBIT IV-11

METHODS USED TO IMPROVE TIME AND COSTS ASSOCIATED WITH APPLICATIONS DEVELOPMENT - DISCRETE MANUFACTURING SECTOR

ITEM	% OF MENTIONS
ON-LINE PROGRAMMING	22%
PROJECT MANAGEMENT AND CONTROL SYSTEMS	17
STRUCTURED PROGRAMMING	16
SOFTWARE PRODUCTS	15
OTHER	30
<ul style="list-style-type: none"> - IMPROVED TRAINING - USER INVOLVEMENT - PRODUCTIVITY MEASUREMENT TOOLS - AUTOMATED DOCUMENTATION - PROGRAM DEVELOPMENT AIDS 	

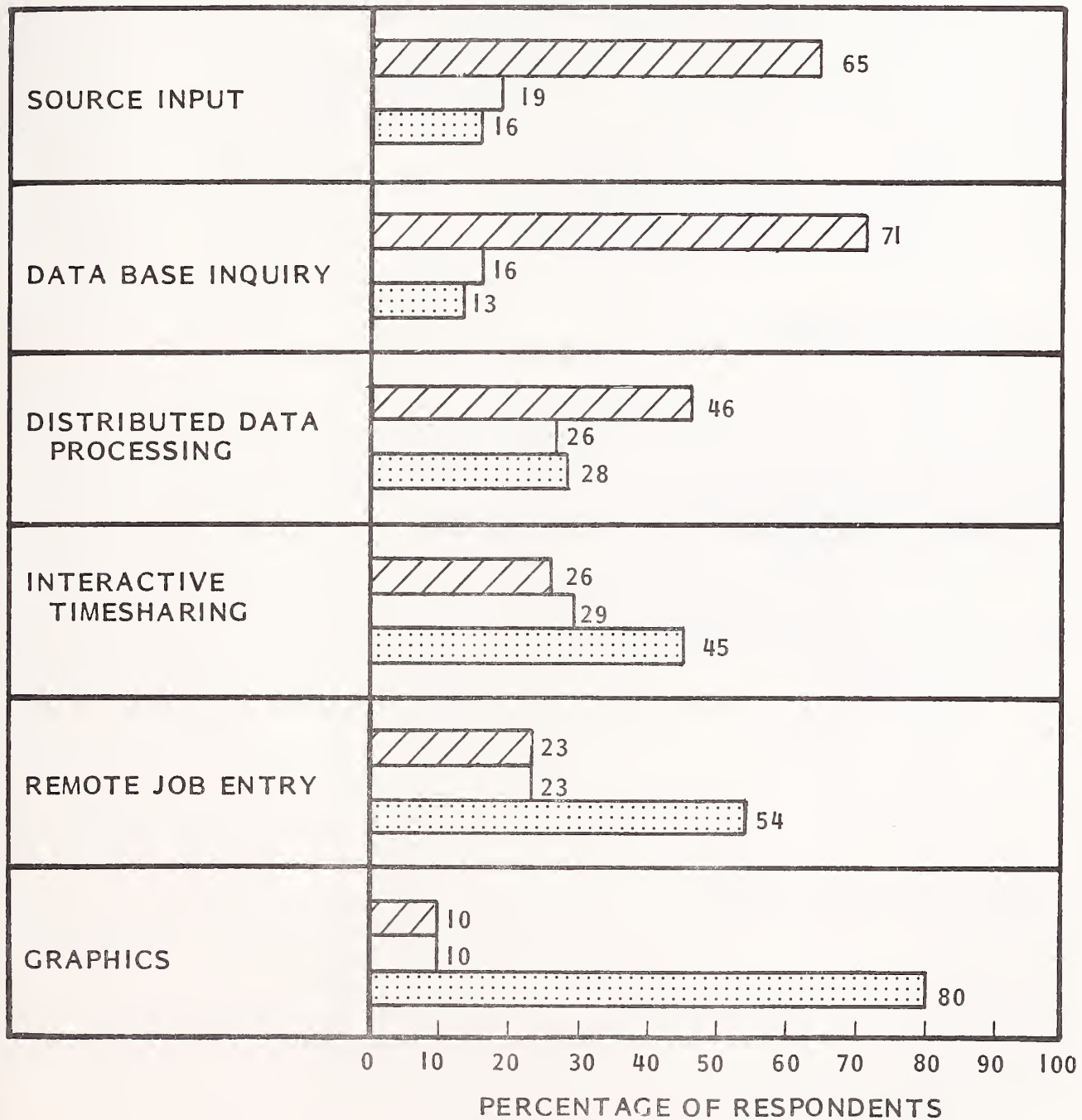
- An analysis of the discrete manufacturing sector in late 1976 indicated that an important near term objective was the installation of terminal devices for increasing the level interactive and remote computing. Exhibit IV-12 indicates a shift to new application areas as being the major focus.
 - Sixty-eight percent of respondents indicated that source data input requirements were of high importance in terms of terminal installations for the next three years.
 - Seventy-four percent of respondents indicated that data base inquiry was of high importance for installing terminals during the next three years.
 - Interactive timesharing, remote job entry and graphics are now considered to be low importance reasons for the future installation of terminals by one-half of the respondents.

4. KEY ISSUE STATUS REVIEW

- Data base management systems have been installed by two-thirds of the 38 discrete manufacturing respondents (see Exhibit IV-13) who provided answers to these questions.
 - In those installations, 52% of the systems were provided by IBM, and 48% by independent software suppliers.
 - The general level of satisfaction with the systems is good, but more than one-third of the respondents with installed DBMS systems are evaluating alternatives.
 - Most of the installations were made since 1975.
- Distributed data processing systems have been installed by 22% of the discrete manufacturing respondents. In addition, 8% of the respondents are presently

EXHIBIT IV-12

RELATIVE IMPORTANCE OF REASONS FOR INSTALLING TERMINALS DURING THE NEXT THREE YEARS- DISCRETE MANUFACTURING SECTOR






-  = HIGH IMPORTANCE
-  = MEDIUM IMPORTANCE
-  = LOW IMPORTANCE

EXHIBIT IV-13

DATA BASE MANAGEMENT SYSTEM STATUS FOR RESPONDENTS IN THE DISCRETE MANUFACTURING SECTOR

FACTOR/CONSIDERATION IN PERCENT OF RESPONDENTS		
DBMS INSTALLED	CURRENTLY EVALUATING ALTERNATIVE DBMS	
YES 66%	YES 24%	NO 42%
NO 34%	YES 18%	NO 16%
<p>IF DBMS INSTALLED:</p> <p><u>DEVELOPER</u></p> <ul style="list-style-type: none"> ● IBM 52% ● OTHER HARDWARE 0 ● INDEPENDENT 48 <p><u>LEVEL OF SATISFACTION</u></p> <ul style="list-style-type: none"> ● SATISFIED 52% ● ACCEPTABLE 36 ● DISSATISFIED 8 ● UNKNOWN 4 <p><u>YEAR OF INSTALLATION</u></p> <ul style="list-style-type: none"> ● 1978 4% ● 1977 28 ● 1976 12 ● 1975 12 ● EARLIER 44 ● NO ANSWER 0 		

implementing DDP systems, 53% are considering DDP, and only 17% indicate that DDP is not applicable (see Exhibit IV-14). DDP uses and intended uses for this industry sector as provided by respondents include:

- Data entry and order processing.
 - Inventory control and production control.
 - Offloading central CPU.
 - Manufacturing applications.
 - Clerical proofing.
 - Remote processing of cost accounting.
- Exhibit IV-15 summarizes the status of various office automation involvement areas by EDP departments in discrete manufacturing. As indicated, a reasonable degree of participation is expected in most areas by 1983 with the exception of video conferencing. One hundred percent participation in the data communications area is forecast by 1983, and more than 60% is expected in the word processing area.

EXHIBIT IV-14

RESPONDENT INVOLVEMENT IN DISTRIBUTED DATA PROCESSING-
DISCRETE MANUFACTURING SECTOR

RESPONSE	PERCENT OF RESPONDENTS
DISTRIBUTED DATA PROCESSING ALREADY INSTALLED	22%
DISTRIBUTED DATA PROCESSING BEING IMPLEMENTED	8
DISTRIBUTED DATA PROCESSING UNDER CONSIDERATION	53
DISTRIBUTED DATA PROCESSING NOT APPLICABLE	17
TOTAL	100%

DDP USE OR INTENDED USE:

- REMOTE PROCESSING
- DATA ENTRY, DATA BASE
- INVENTORY CONTROL, PRODUCTION CONTROL
- MANUFACTURING APPLICATIONS
- CLERICAL PROOFING
- PROCESS ORDERS
- OFFLOAD MAIN CPU
- COST ACCOUNTING

EXHIBIT IV-15

RESPONDENT INVOLVEMENT IN OFFICE AUTOMATION - DISCRETE MANUFACTURING SECTOR

AREA OF INVOLVEMENT	PERCENT OF RESPONDENTS		
	CURRENT	BETWEEN 1978 AND 1983	NOT BY 1983
ELECTRONIC MAIL	23%	27%	50%
WORD PROCESSING	35	28	37
COPYING/DUPLICATING	23	12	65
DATA COMMUNICATIONS	91	9	-
VOICE COMMUNICATIONS	21	10	69
FACSIMILE	28	12	60
VIDEO CONFERENCING	5	10	85

B. PROCESS MANUFACTURING

B. PROCESS MANUFACTURING

I. INDUSTRY SECTOR OVERVIEW

- The process manufacturing sector is comprised of over 140,000 United States establishments with 8 million employees. This sector contains approximately 300 firms with annual sales exceeding \$300 million.
 - The chemicals and allied products industry is expected to reach \$123 billion in 1978, 10% over 1977.
 - Agricultural Chemicals with \$2.9 billion in shipments in 1977 is expecting a drop in 1978 as the result of lower foreign trade.
 - Plastic materials and resins will have 1978 shipments of more than \$10 billion, 14% above 1977, while paint products account for another \$6.7 billion and soaps and detergents an additional \$6.6 billion, each up 10% or 11%.
 - The value of drug shipments in 1978 will be \$13.6 billion, less than 10% above 1977.
 - Food, beverage, tobacco, and textiles and other consumer oriented process industries are forecast to experience lower growth rates in the 6-7% range.
- As compared with discrete manufacturing, the respondents in the process manufacturing sector appear to be growing slower and more along inflationary lines with individual company growth just slightly exceeding overall industry growth.

- The importance of EDP in achieving company growth was ranked somewhat higher in this sector than in discrete manufacturing with several indications that EDP was of major importance. Analysis within subsectors shows that this attitude is more prevalent in chemicals and petroleum companies than in paper products and food processing where EDP use tends to be more along traditional lines.
- Top management concerns are oriented toward control rather than cost issues. In this regard, the subjects of commonality of systems, software portability and centralization surfaced frequently in place of cost reduction or cost avoidance. 1978 also appears to have been a year where budget plans are being met or are coming in lower than planned.
- Somewhat more concern was displayed than in other sectors with regard to contingency planning for a 1979 recession. In two instances, actual plans were developed as part of new budget submissions. One company reported still to be operating under 1974 constraints.
- Process manufacturing yielded 86 responses in four different questionnaire categories, or 17% of the total for this report. The contributing industry groups included companies with SIC codes in the 10, 12, 14, 20, 21, 22, 24, 26, 28, 29, 30, 32, and 33 categories.
 - Of these, the majority of responses came from food products (SIC 10), and paper products (SIC 26). The next highest categories were textile mill products (SIC 22) and chemical products (SIC 28).
- Exhibit IV-16 provides a profile summary of respondents in the process manufacturing sector for companies in three size categories.
 - One-sixth (16%) of the companies reported annual sales of less than \$100 million with a range of \$30 million to \$80 million, and averaging \$67 million. This average company employs 1,575 personnel of which 19 (1.2%) are EDP personnel, and has an annual EDP budget of \$535,000

EXHIBIT IV-16

RESPONDENT PROFILE- PROCESS MANUFACTURING SECTOR

PROFILE CHARACTERISTIC	COMPANY SIZE IN TERMS OF ANNUAL SALES/REVENUES		
	LESS THAN \$100 MILLION	\$100-999 MILLION	MORE THAN \$1000 MILLION
PERCENT OF RESPONDENTS	16%	72%	12%
AVERAGE ANNUAL SALES	\$67M	\$349M	\$3.12B
AVERAGE TOTAL EMPLOYEES	1,575	4,168	42,400
AVERAGE EDP EMPLOYEES	19	55	439
EDP EMPLOYEES PER 100 TOTAL EMPLOYEES	1.2	1.3	1.0
AVERAGE EDP BUDGET	\$535,000	\$1,925,000	\$18,650,000
EDP BUDGET % OF ANNUAL SALES	0.79%	0.55%	0.59%
EDP BUDGET PER EDP EMPLOYEE	\$28,200	\$35,000	\$42,500
EDP BUDGET PER TOTAL EMPLOYEE	\$340	\$462	\$440

(.8% of annual sales) which translates to \$28,200 per EDP employee and about \$340 per total company employee.

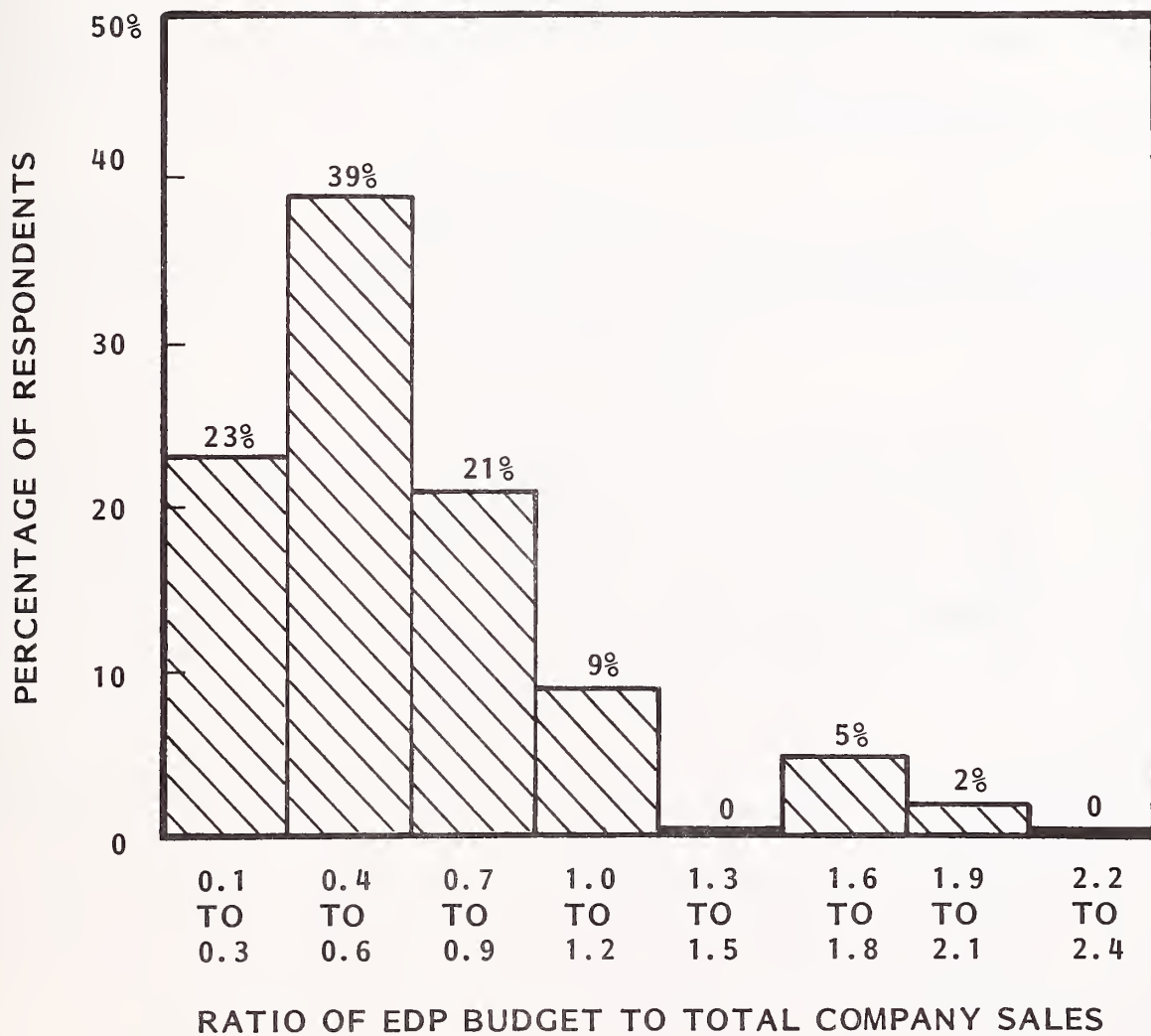
- Almost 75% of the respondents ranged in size from \$100 million to \$1 billion in annual sales. The average company in this category has sales of \$349 million, employs 4,200 people of which 55 (1.3%) are involved in EDP, and has an EDP budget of \$1.925 million which represents .55% of the company's annual sales.
- The largest process manufacturing companies responding to INPUT's survey average \$3.1 billion in annual sales and employ an average of 439 EDP personnel, slightly more than 1% of the total 42,400 employees. These companies reported EDP budgets which average \$18.6 million or about .6% of their total company sales.
- Additional observations from Exhibit IV-16 include:
 - The ratio of EDP budget to annual sales is lower in the process manufacturing sector than it is for discrete manufacturing, except for the large multi-billion firms.
 - The EDP budget per EDP employee and EDP budget per total employee statistics are very similar to those calculated for the discrete manufacturing sector except for smaller companies.
- Exhibit IV-17 provides a measure of the range of values for the ratio of EDP budget to total company sales reported by process manufacturing respondents. The mean value for the industry is .73% compared to 1.27% for respondents across all industries.

2. BUDGET AND EXPENDITURE ANALYSIS

- EDP expenditures in the process manufacturing sector will increase an average of 9.9% in 1979 according to respondents, but will continue at a somewhat

EXHIBIT IV-17

DISTRIBUTION OF EDP BUDGET TO
COMPANY SALES RATIOS FOR RESPONDENTS IN THE
PROCESS MANUFACTURING SECTOR



higher rate through 1983. Exhibit IV-18 provides a distribution of planned budget growth for the 1978 to 1979 period.

- As a percentage of the total EDP budget, expenditures for small computers, terminals, communications, and software will rise steadily in 1979 and 1980. During the same period, expenditures for mainframe computers, personnel, and miscellaneous other (supplies, forms, etc.) are forecast to decrease as a percentage as indicated in Exhibit IV-19.
 - Based on the expected 9.9% budget increase for 1979, the absolute dollar expenditure in every budget category will be higher except in the miscellaneous other category.
- Exhibit IV-20 provides a measure of the continuing growth of computer services and software in the process manufacturing sector as foreseen by EDP managers. As shown, significant increases are expected in 1978 for most types of services.
 - It should be noted that the decline or low increase in processing services expenditures represent significant differences from previous INPUT forecasts. It is our opinion that control of most outside services purchases is not usually vested in the central EDP department (the source of most data contained in this report).
 - While there is movement toward bringing remote computing services "in-house" which will reduce outside expenditures under EDP department control, there is still a significant increase in end user expenditure taking place as evidenced by other INPUT studies of the situation.
 - Based on INPUT's 1978 study of the computer services industry, expenditure increases from 1977 to 1978 for process manufacturing are expected as follows: 21% for remote computing, 11% for batch, 36% for software products, 5% for professional services, and 17% overall.

EXHIBIT IV-18

1978-1979 PLANNED EDP BUDGET GROWTH
FOR RESPONDENTS -
PROCESS MANUFACTURING SECTOR

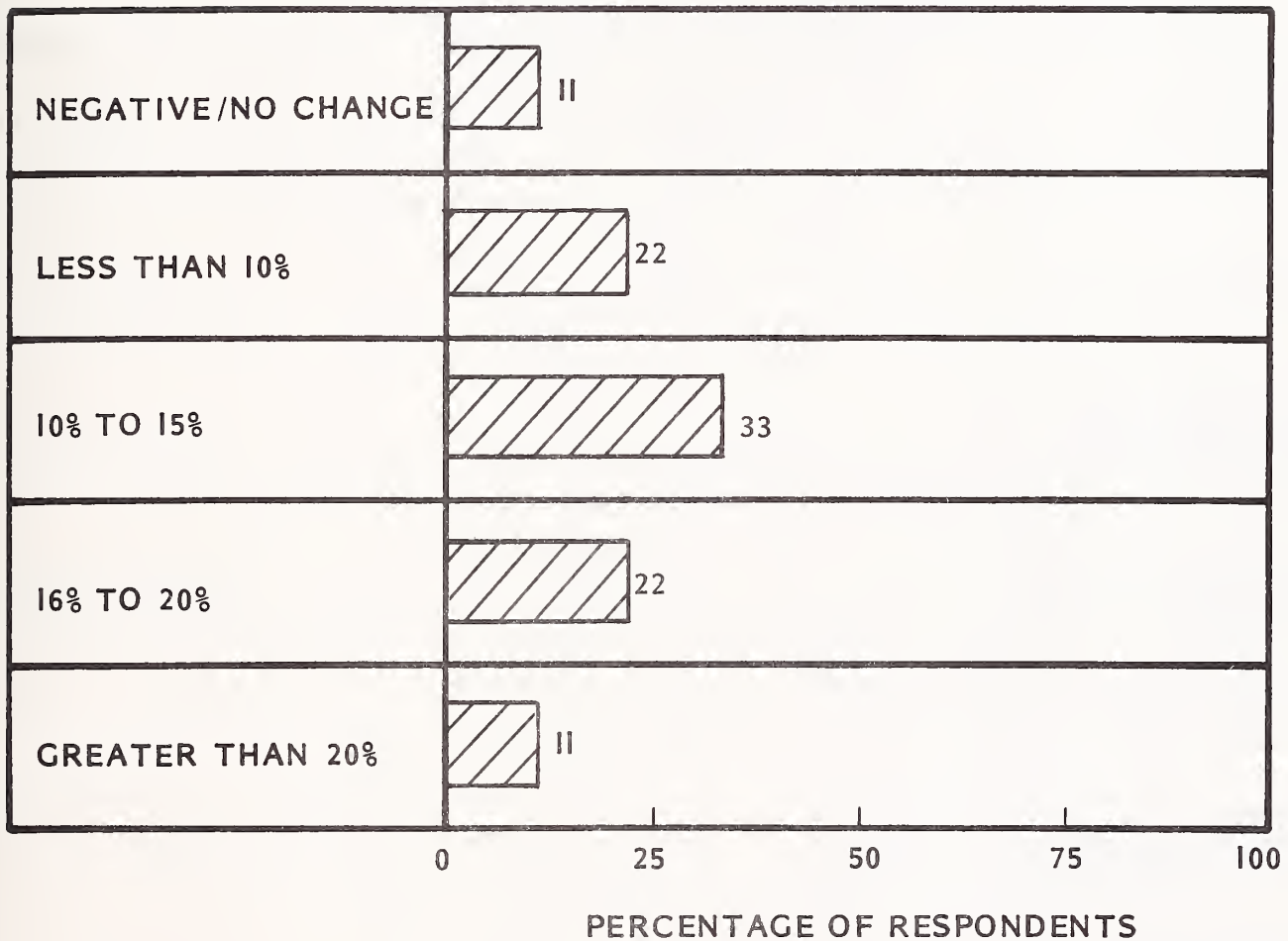


EXHIBIT IV-19

ANTICIPATED CHANGES IN EDP BUDGETS FOR RESPONDENTS IN THE PROCESS MANUFACTURING SECTOR

BUDGET CATEGORY	% OF TOTAL EDP BUDGET			INCREASE (DECR.) 1978 TO 1980
	1978	1979	1980	
MAIN COMPUTERS	27%	26%	26%	(4)%
SMALL COMPUTERS / PROGRAMMABLE TERMINALS	6	7	9	50
NON-PROGRAMMABLE TERMINALS	2	3	4	100
COMMUNICATIONS	3	4	6	100
SOFTWARE (PURCHASE/LEASE)	3	4	5	67
PERSONNEL	46	45	43	(7)
OTHER	10	9	7	(30)

EXHIBIT IV-20

AVERAGE EXPENDITURES FOR SERVICES AND SOFTWARE IN THE
PROCESS MANUFACTURING SECTOR

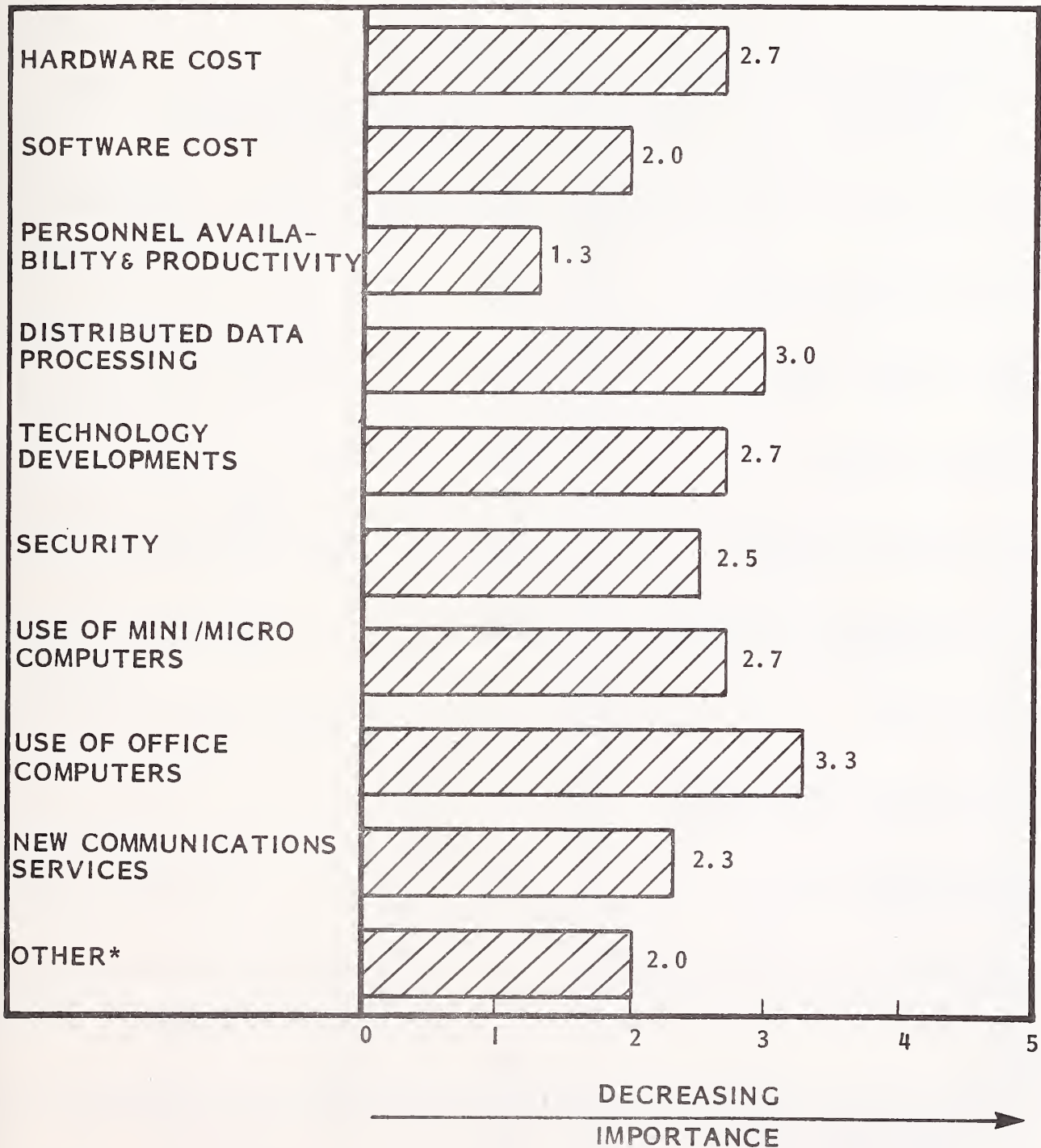
TYPE OF SERVICE	1977 EXPENDI- TURES AVERAGE IN \$000	1978 EXPENDI- TURES AVERAGE IN \$000	PERCENT CHANGE 1977 VS. 1978
<u>PROCESSING SERVICES</u>			
INTERACTIVE	\$61	\$63	3 %
REMOTE BATCH	19	15	(21)
BATCH	4	4	0
INPUT/OUTPUT	10	11	1
<u>SOFTWARE PRODUCTS</u>			
SYSTEMS SOFTWARE	\$30	\$34	14 %
APPLICS. SOFTWARE	25	48	92
<u>PROFESSIONAL SERVICES</u>			
CONTR. PROGRAMMING	\$36	\$56	56 %
EDP CONSULTING	20	14	(30)
EDUCATION	10	13	30
OTHER	12	18	50
<u>FACILITIES MANAGEMENT</u>	-	-	-
<u>MAINTENANCE</u>	\$75	\$96	28 %

3. MAJOR PLANS AND PROBLEMS

- Study respondents who were visited or contacted by telephone for this study were asked to rank the importance of certain EDP/communications factors. As shown in Exhibit IV-21 the most important factors in the process manufacturing sector were personnel availability and productivity and software related.
- All respondents to this study were queried regarding major EDP objectives for 1978, 1979, and 1980. Exhibit IV-22 summarizes their responses and provides a ranking based on the number of mentions for major categories.
 - New application development and on-line application development remained at a high level through 1980, accounting for nearly 40% of all mentions.
 - The implementation of data base and distributed data processing systems nearly doubles as a combined percentage of mention in 1980.
 - The installation and upgrade of mainframes picks up as an objective in 1980, consistent with the planned high delivery rates of IBM 303X among respondents.
- Exhibit IV-23 provides an indication of the applications being planned and developed by the process manufacturing sector, together with an indication of which applications are considered to be of highest priority.
 - As in the case of discrete manufacturing, accounting/finance and order entry applications rank high both in the number of mentions and the level of priority.
 - Financial and administrative applications received two-thirds of the total mentions, outpacing marketing and technically oriented applications.

EXHIBIT IV-21

IMPORTANCE OF EDP/COMMUNICATION FACTORS RANKED
BY RESPONDENTS IN THE PROCESS MANUFACTURING SECTOR



*SPECIFIC FACTORS MENTIONED INCLUDE:

- DATA BASE MANAGEMENT SYSTEMS

EXHIBIT IV-22

EDP OBJECTIVES FOR RESPONDENTS IN THE PROCESS MANUFACTURING SECTOR

OBJECTIVE	PERCENT OF MENTIONS		
	1978	1979	1980
DATA BASE DEVELOPMENT	10%	7%	12%
DESIGN/INSTALL DDP	5	8	14
NEW APPLICATIONS	19	18	20
ON-LINE APPLICATIONS	18	24	16
INSTALL/UPGRADE MAINFRAME	12	11	18
INSTALL MINIS	2	3	0
INSTALL OPERATING SYSTEM	2	3	4
IMPROVE OPERATIONS	15	8	6
CENTRALIZE (OR DECENTRALIZE)	7	12	8
OTHER*	<u>10</u> 100%	<u>6</u> 100%	<u>2</u> 100%
TOTAL MENTIONS	84	74	49

*SPECIFIC RESPONSES INCLUDE:

- Develop Long Range Plans
- Downgrade Mainframe
- Reduce Hardware Costs
- Electronic Mail

EXHIBIT IV-23

APPLICATIONS TO BE DEVELOPED BY RESPONDENTS IN THE PROCESS MANUFACTURING SECTOR

APPLICATION	PERCENT OF MENTIONS	% OF MENTIONS AS HIGHEST PRIORITY
ACCOUNTING/FINANCE	20%	18%
COST SYSTEMS	5	3
INVENTORY CONTROL	10	13
ORDER ENTRY/BILLING	16	28
PERSONNEL/PAYROLL	12	7
PURCHASING	4	2
MARKETING/SALES	5	3
MODELING/FORECASTING	3	0
COMMUNICATIONS	2	0
GRAPHICS	1	0
SCIENTIFIC/ENGINEERING	1	0
DATA BASE	5	7
ELECTRONIC MAIL	0	0
WORD PROCESSING	1	0
PERFORMANCE MEASUREMENT	0	0
OTHER* (INDUSTRY SPECIFIC)	15	19
TOTAL	100%	100%

*SPECIFIC APPLICATIONS INCLUDE:

- Manufacturing
- Scheduling
- Distribution

- Lack of user involvement in system and application development and need for improved operations are considered to be the most significant EDP problems in the process manufacturing sector as shown in Exhibit IV-24.
 - This represents a change from 1976 when communications and security were given as the most significant problems.
- Consistent with other manufacturing industry respondents, the process manufacturing sector uses nearly as much of its equipment and applications programming personnel resources for maintaining existing programs as developing new ones (see Exhibit IV-25).
- Exhibit IV-26 provides a list and ranking of the most popular methods being used in the process manufacturing sector to reduce or improve the time and cost associated with the development of new applications.
 - The purchase of outside software and the use of on-line programming techniques comprise more than 50% of all mentions.
- The expected increase in expenditures for communications and terminal devices through 1980 in the process manufacturing sector is further clarified by analyzing the reasons for terminal installation for the same period. Exhibit IV-26 provides such an analysis.
 - Eighty-six percent of respondents indicate that source data input requirements were of high importance in terms of their terminal installations for the next three years (see Exhibit IV-27).
 - Approximately one-half of all respondents stated that data base inquiry and distributed data processing applications were reasons of high importance for installing terminals.

EXHIBIT IV-24

MOST SIGNIFICANT EDP PROBLEMS BY RESPONDENTS IN THE PROCESS MANUFACTURING SECTOR

ITEM	% OF MENTIONS
LACK OF USER INVOLVEMENT IN SYSTEM/APPLICATION DEVELOPMENT	15%
NEED FOR OPERATIONS IMPROVEMENT	15
LACK OF EFFECTIVE LONG-RANGE EDP PLANS	9
PERSONNEL PRODUCTIVITY AND AVAILABILITY	7
NEED FOR MORE EFFECTIVE COST CONTROL	7
LACK OF STANDARDS AND DOCUMENTATION	7
LACK OF UNDERSTANDING BY NON-EDP MANAGEMENT	7
IMPROPER ORGANIZATION	5
NEED FOR FACILITY UPGRADE (INCLUDING HARDWARE)	5
OTHER	23
<ul style="list-style-type: none"> - RELUCTANCE TO CHANGE - INABILITY TO EVALUATE ALTERNATIVES - DDP IMPLEMENTATION - USER EDUCATION - CONSOLIDATION/ELIMINATION OF EXISTING SYSTEMS - EDP AUDITING - GUIDING THE ORGANIZATION FROM CENTRALIZED TO EFFECTIVE DISTRIBUTED STRUCTURE 	

EXHIBIT IV-25

USE OF RESOURCES - PROCESS MANUFACTURING SECTOR

RESOURCE UTILIZATION CATEGORIES	RESPONDENT AVERAGE
<ul style="list-style-type: none"> ● COMPUTER EQUIPMENT : <ul style="list-style-type: none"> - PRODUCTION RUNS - NEW APPLICATION DEVELOPMENT - EXISTING PROGRAM MAINTENANCE - OTHER¹ 	<p>67%</p> <p>16</p> <p>14</p> <p>3</p> <hr/> <p>100%</p>
<ul style="list-style-type: none"> ● APPLICATION PROGRAMMING PERSONNEL: <ul style="list-style-type: none"> - NEW PROGRAM DEVELOPMENT - EXISTING PROGRAM MAINTENANCE - OTHER² 	<p>54%</p> <p>43</p> <p>3</p> <hr/> <p>100%</p>

OTHER MENTIONS INCLUDE:

¹ IDLE TIME

² TRAINING
SPECIAL MARKETING PROMOTIONS

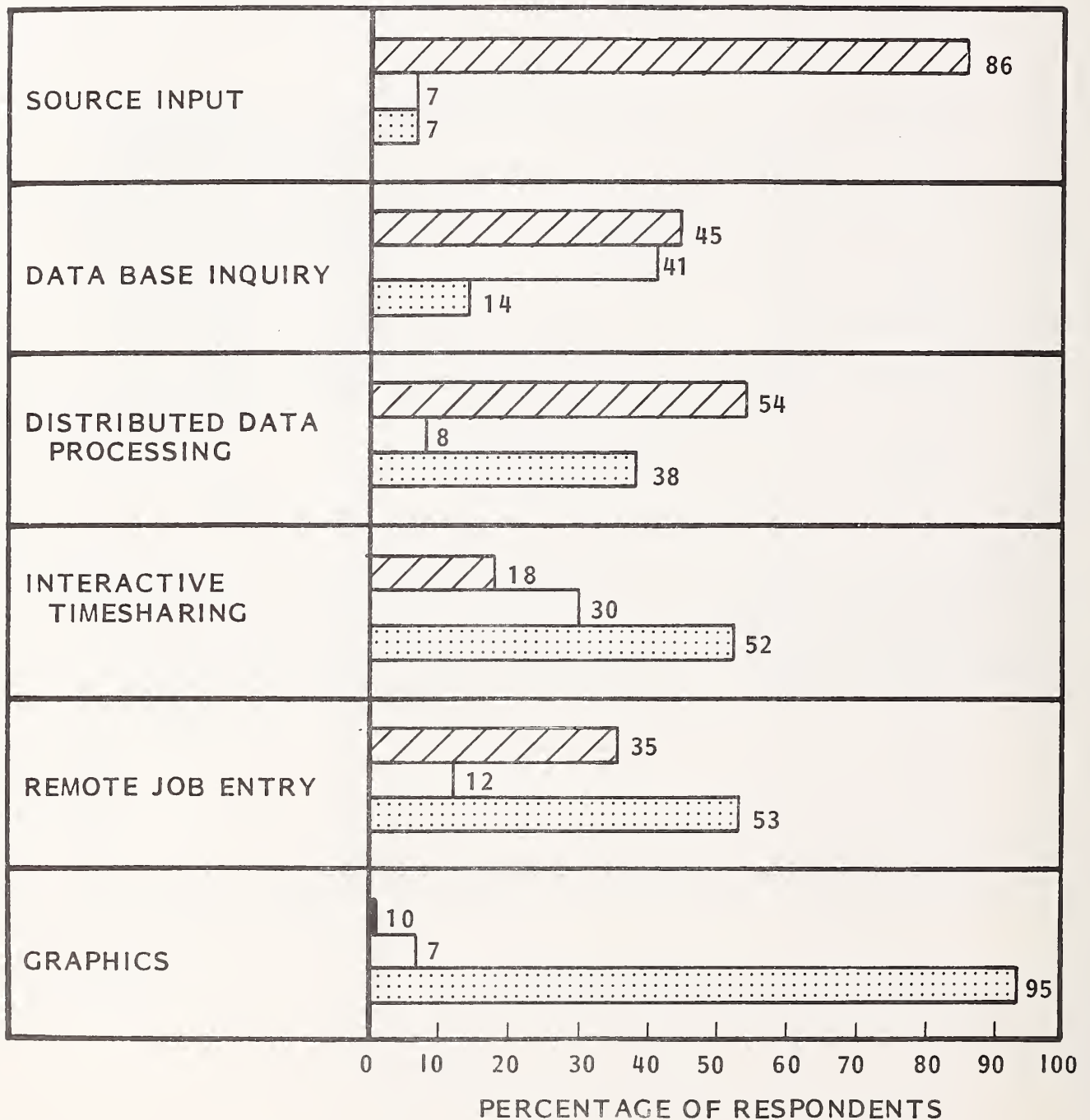
EXHIBIT IV-26




METHODS USED TO IMPROVE TIME AND COSTS ASSOCIATED WITH APPLICATIONS DEVELOPMENT- PROCESS MANUFACTURING SECTOR

METHOD	% OF MENTIONS
PURCHASED SOFTWARE PACKAGES	32%
ON-LINE PROGRAMMING	21
STRUCTURED PROGRAMMING	11
MORE EXPERIENCED AND TRAINED PERSONNEL	11
OTHER	25
<ul style="list-style-type: none"> - DBMS - IMPROVED STANDARDS - PROGRAMMING AIDS - PROJECT MANAGEMENT - USER INVOLVEMENT 	

EXHIBIT IV-27

RELATIVE IMPORTANCE OF REASONS FOR INSTALLING TERMINALS DURING THE NEXT THREE YEARS - PROCESS MANUFACTURING SECTOR



-  = HIGH IMPORTANCE
-  = MEDIUM IMPORTANCE
-  = LOW IMPORTANCE

- Interactive timesharing and remote job entry have dropped to the point where more than one-half of the respondents rank these as reasons of low importance for terminal installation in the next three years.

4. KEY ISSUE STATUS REVIEW

- Data base management systems have been installed by 53% of the 32 process manufacturing firms responding to DBMS questions as shown in Exhibit IV-28. In those installations:
 - Forty-one percent of the systems were provided by IBM, 18% by other hardware vendors, and 41% by independent software suppliers.
 - The general level of satisfaction with the installed DBMS systems is good, although one-fourth of those firms with DBMS are evaluating alternatives.
 - Most of the installations were made since 1976.
- Distributed data processing systems of some type exist in 36% of the process manufacturing respondent's firms. In addition, 10% of the respondents are presently implementing DDP systems, 40% are considering DDP systems, and only 14% indicate that DDP is not applicable (see Exhibit IV-29). DDP applications and intended applications for this industry sector as given by respondents include:
 - Plant/division processing.
 - EDP centralization.
 - Offloading central CPU.
 - Data collection, editing, and inquiry.

EXHIBIT IV-28

DATA BASE MANAGEMENT SYSTEM STATUS FOR RESPONDENTS IN THE PROCESS MANUFACTURING SECTOR

FACTOR/CONSIDERATION IN PERCENT OF RESPONDENTS		
DBMS INSTALLED	CURRENTLY EVALUATING ALTERNATIVE DBMS	
YES 53%	YES 12%	NO 41%
NO 47%	YES 9%	NO 38%
<p>IF DBMS INSTALLED:</p> <p><u>DEVELOPER</u></p> <ul style="list-style-type: none"> ● IBM 41% ● OTHER HARDWARE 18 ● INDEPENDENT 41 <p><u>LEVEL OF SATISFACTION</u></p> <ul style="list-style-type: none"> ● SATISFIED 65% ● ACCEPTABLE 12 ● DISSATISFIED 12 ● UNKNOWN 11 <p><u>YEAR OF INSTALLATION</u></p> <ul style="list-style-type: none"> ● 1978 12% ● 1977 35 ● 1976 12 ● 1975 6 ● EARLIER 35 ● NO ANSWER 0 		

EXHIBIT IV-29

RESPONDENT INVOLVEMENT IN DISTRIBUTED DATA PROCESSING-
PROCESS MANUFACTURING SECTOR

RESPONSE	PERCENT OF RESPONDENTS
DISTRIBUTED DATA PROCESSING ALREADY INSTALLED	36%
DISTRIBUTED DATA PROCESSING BEING IMPLEMENTED	10
DISTRIBUTED DATA PROCESSING UNDER CONSIDERATION	40
DISTRIBUTED DATA PROCESSING NOT APPLICABLE	14
TOTAL	100%

- Order entry.

- Payroll.

- Exhibit IV-30 summarizes the status of various office automation involvement areas by EDP departments in process manufacturing. Not surprisingly, the highest level of participation is in the data communications area with a reasonable level of participation in word processing, facsimile and electronic mail expected by 1983. Consistent with other industry sectors, video conferencing is not expected to be the subject of much attention.

EXHIBIT IV-30

RESPONDENT INVOLVEMENT IN OFFICE AUTOMATION - PROCESS MANUFACTURING SECTOR

AREA OF INVOLVEMENT	PERCENT OF RESPONDENTS		
	CURRENT	BETWEEN 1978 AND 1983	NOT BY 1983
ELECTRONIC MAIL	17%	36%	47%
WORD PROCESSING	33	39	28
COPYING/DUPLICATING	22	11	67
DATA COMMUNICATIONS	88	12	-
VOICE COMMUNICATIONS	30	16	54
FACSIMILE	51	10	39
VIDEO CONFERENCING	6	11	83

C. TRANSPORTATION

C. TRANSPORTATION

I. INDUSTRY SECTOR OVERVIEW

- The transportation sector is comprised of over 130,000 United States establishments with 3 million employees. Characteristically, transportation companies have a multiplicity of operating locations and a high requirement for communication.
 - A growing economy in 1977 was the main reason for rising railroad freight traffic and will be the dominant factor again in 1978.
 - Growth in gross national product and business inventories are boosting truck traffic again in 1978.
 - Airline revenue passenger miles are scheduled to grow at an annual rate of at least 5%.
- Respondents in this sector varied in their expectations of growth as a function of their subsector, from relatively low for railroads and transit companies to relatively high for motor freight.
- The importance of EDP in this sector varies more widely than in any others, ranging from vital in the airline category to minor in the transportation service category.
- Major EDP concerns for transportation companies are oriented along the lines of cost and improved price performance, perhaps reflecting a need to optimize previous system investments. No special concerns were displayed with regard to a 1979 recession and no special budget considerations were evidenced.

- Transportation yielded 23 responses in three different questionnaire categories, or 5% of the total for this report. The contributing industry groups included companies with SIC codes in the 40, 42, 44, 45, and 47 categories.
 - Of these, about two-thirds were motor freight and air transport firms. The United States Postal Service (SIC 43) was not solicited.
- Exhibit IV-31 provides a profile summary of respondents in the transportation sector for companies in three size categories.
 - Only 10% of the companies reported annual sales of less than \$100 million, averaging \$80 million. This average company employs 970 employees of which 14 (1.4%) are EDP personnel, and has an annual EDP budget of \$435,000 (.5% of annual sales), which translates to \$31,100 per EDP employee and about \$450 per total employee.
 - Seventy percent of the respondents ranged in size from \$100 million to \$1 billion in annual sales. The average company in this category has sales of \$162 million, employs 3,250 people of which 40 (1.2%) are involved in EDP and has an EDP budget of \$1.2 million which represents .7% of the company's annual sales.
 - The largest transportation companies responding to INPUT's survey average almost \$1.2 billion in annual sales and employ an average of 330 EDP personnel, about 1.3% of the total 26,000 employees. These companies reported EDP budgets which average \$19.7 million or 1.7% of their total company sales.
- Additional observations from Exhibit IV-31 include:
 - The EDP budget as a percent of annual sales increases with the size of the company, reflecting the investment required for larger and more complex systems. This is contrary to the situation found in the manufacturing sectors.

EXHIBIT IV-3I

RESPONDENT PROFILE -
TRANSPORTATION SECTOR

PROFILE CHARACTERISTIC	COMPANY SIZE IN TERMS OF ANNUAL SALES/REVENUES		
	LESS THAN \$100 MILLION	\$100-999 MILLION	MORE THAN \$1000 MILLION
PERCENT OF RESPONDENTS	10%	70%	20%
AVERAGE ANNUAL SALES	\$80M	\$162M	\$1.17B
AVERAGE TOTAL EMPLOYEES	970	3250	26,000
AVERAGE EDP EMPLOYEES	14	40	330
EDP EMPLOYEES PER 100 TOTAL EMPLOYEES	1.4	1.2	1.3
AVERAGE EDP BUDGET	\$435,000	\$1,184,000	\$19,733,000
EDP BUDGET % OF ANNUAL SALES	0.5%	0.7%	1.7%
EDP BUDGET PER EDP EMPLOYEE	\$31,100	\$29,600	\$59,800
EDP BUDGET PER TOTAL EMPLOYEE	\$448	\$364	\$760

- The EDP budget per EDP employee and total employee statistics for large firms are considerably higher in transportation than in the manufacturing sector, although not as high as the utility sector and other service sectors.
- Exhibit IV-32 provides a measure of the range of values for the ratio of EDP budget to total company sales reported by transportation respondents. The mean value for the industry is .8% compared to 1.27% for respondents across all industries.

2. BUDGET AND EXPENDITURE ANALYSIS

- EDP expenditures in the transportation sector will increase an average of 17% in 1979 according to respondents, but will continue at a lower rate through 1983. Exhibit IV-33 provides a distribution of planned budget growth for the 1978 to 1979 period, and indicates the broad range of expectations reflected by the different types of companies that comprise this sector.
- As a percentage of the total EDP budget, expenditures for small computers, software, and personnel will rise steadily in 1979 and 1980. During the same period, expenditures for mainframe computers, non-programmable terminals, and communications are forecast to decrease as a percentage of expenses as indicated in Exhibit IV-34.
 - This was the only sector projecting a lower communications expenditure for 1979 and 1980.
- Exhibit IV-35 provides a measure of the expenditures of computer services and software in the transportation sector as foreseen by EDP managers. As shown, significant increases are expected in 1978 for professional services and maintenance.
 - It should be noted that the decline or low increase in certain categories of services expenditures represent significant differences from previous

EXHIBIT IV-32

DISTRIBUTION OF EDP BUDGET TO COMPANY SALES RATIOS FOR RESPONDENTS IN THE TRANSPORTATION SECTOR

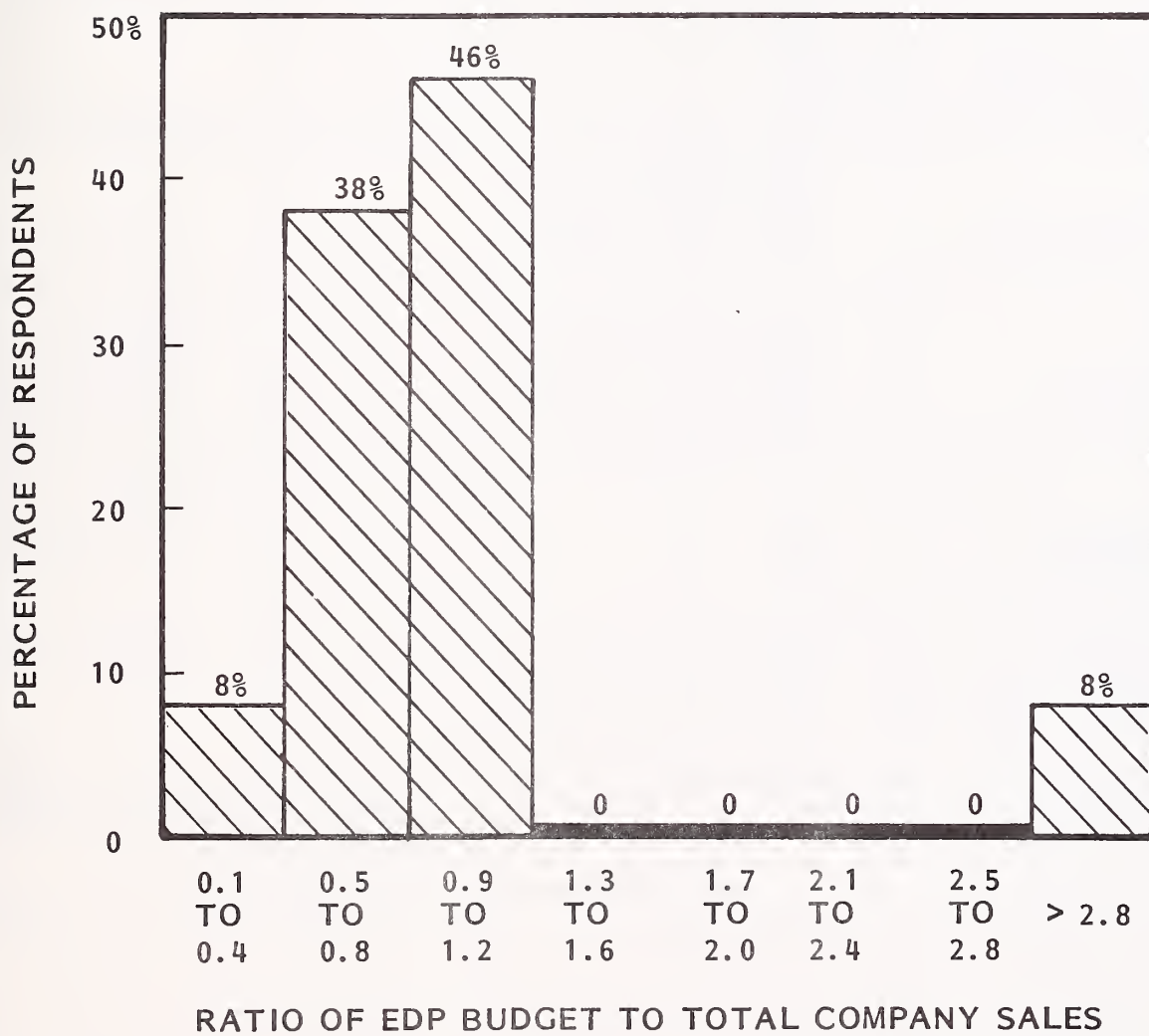


EXHIBIT IV-33

1978-1979 PLANNED EDP BUDGET GROWTH
FOR RESPONDENTS -
TRANSPORTATION SECTOR

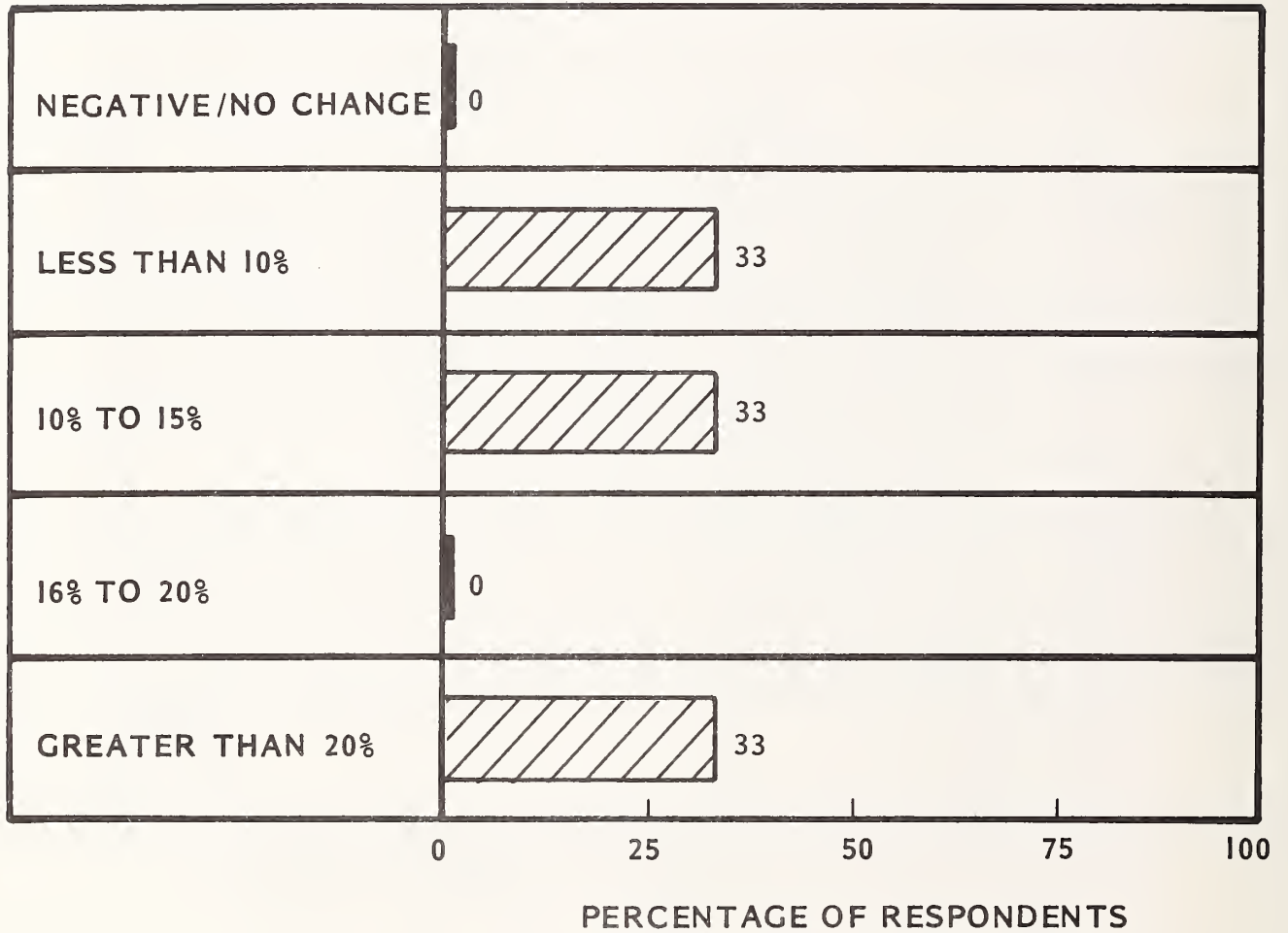


EXHIBIT IV-34

ANTICIPATED CHANGES IN EDP BUDGETS FOR RESPONDENTS IN THE
TRANSPORTATION INDUSTRY

BUDGET CATEGORY	% OF TOTAL EDP BUDGET			INCREASE (DECR.) 1978 TO 1980
	1978	1979	1980	
MAIN COMPUTERS	26%	28%	20%	(23)%
SMALL COMPUTERS/ PROGRAMMABLE TERMINALS	3	4	4	33
NON-PROGRAMMABLE TERMINALS	6	3	3	(50)
COMMUNICATIONS	6	5	4	(33)
SOFTWARE (PURCHASE/LEASE)	3	5	6	100
PERSONNEL	45	48	48	7
OTHER	5	5	5	0

EXHIBIT IV-35

AVERAGE EXPENDITURES FOR SERVICES AND SOFTWARE IN THE
TRANSPORTATION SECTOR

TYPE OF SERVICE	1977 EXPENDI- TURES AVERAGE IN \$000	1978 EXPENDI- TURES AVERAGE IN \$000	PERCENT CHANGE 1977 VS. 1978
<u>PROCESSING SERVICES</u>			
INTERACTIVE	\$ 83	\$ 77	(7)%
REMOTE BATCH	-	-	-
BATCH	5	7	40
INPUT /OUTPUT	6	11	83
<u>SOFTWARE PRODUCTS</u>			
SYSTEMS SOFTWARE	\$ 44	\$ 30	(32)%
APPLICS. SOFTWARE	72	60	(17)
<u>PROFESSIONAL SERVICES</u>			
CONTR. PROGRAMMING	\$106	\$162	53 %
EDP CONSULTING	0	12	-
EDUCATION	15	18	20
OTHER	9	13	56
<u>FACILITIES MANAGEMENT</u>	-	-	-
<u>MAINTENANCE</u>	\$501	\$802	60%

INPUT forecasts. It is our opinion that control of most outside services purchases is not usually vested in the central EDP department (the source of most data contained in this report).

- While there is movement toward bringing remote computing services "in-house" which will reduce outside expenditures under EDP department control, there is still a significant increase in end user expenditure taking place as evidenced by other INPUT studies of the situation.
- The INPUT computer services market forecast for the transportation sector for the 1977-1978 period shows increases of 23% for remote computing, 17% for batch processing, 7% for software products, 17% for professional services, and 18% overall.

3. MAJOR PLANS AND PROBLEMS

- All respondents to this study were queried regarding major EDP objectives for 1978, 1979, and 1980. Exhibit IV-36 summarizes their responses and provides a ranking based on the number of mentions for major categories.
 - New application development and on-line application development remains at a high level through 1980, accounting for two-thirds of all mentions.
 - The installation of mainframes and minicomputers picks up as an objective in 1979.
 - Plans for the implementation of data base and distributed data processing systems in transportation are the lowest for any industry.
- Exhibit IV-37 provides an indication of the applications being planned and developed by the transportation sector, together with an indication of which applications are considered to be of highest priority.

EXHIBIT IV-36

EDP OBJECTIVES FOR RESPONDENTS IN
THE TRANSPORTATION SECTOR

OBJECTIVE	PERCENT OF MENTIONS		
	1978	1979	1980
DATA BASE DEVELOPMENT	5%	0%	0%
DESIGN/INSTALL DDP	0	0	0
NEW APPLICATIONS	20	18	11
ON-LINE APPLICATIONS	15	24	56
INSTALL/UPGRADE MAINFRAME	15	18	11
INSTALL MINIS	5	18	11
INSTALL OPERATING SYSTEM	15	5	11
IMPROVE OPERATIONS	15	12	0
CENTRALIZE (OR DECENTRALIZE)	5	5	0
OTHER*	5	0	0
	100%	100%	100%
TOTAL MENTIONS	20	17	9

*SPECIFIC RESPONSES INCLUDE:

- Long Range Planning

EXHIBIT IV-37

APPLICATIONS TO BE DEVELOPED BY RESPONDENTS IN THE
TRANSPORTATION SECTOR

APPLICATION	PERCENT OF MENTIONS	% OF MENTIONS AS HIGHEST PRIORITY
ACCOUNTING/FINANCE	20%	38%
COST SYSTEMS	6	0
INVENTORY CONTROL	9	8
ORDER ENTRY/BILLING	4	8
PERSONNEL/PAYROLL	15	8
PURCHASING	0	0
MARKETING/SALES	2	0
MODELING/FORECASTING	0	0
COMMUNICATIONS	0	0
GRAPHICS	0	0
SCIENTIFIC/ENGINEERING	4	0
DATA BASE	4	0
ELECTRONIC MAIL	0	0
WORD PROCESSING	0	0
PERFORMANCE MEASUREMENT	0	0
OTHER* (INDUSTRY SPECIFIC)	36	38
TOTAL	100%	100%

*SPECIFIC APPLICATIONS INCLUDE:

- Industry Specialized
- Scheduling

- As is the case for manufacturing, accounting/finance applications rank high both in the number of mentions and the level of priority.
- Financial and administrative applications received more than one-half of the total mentions, outpacing marketing and technically oriented applications.
- Personnel availability/productivity and need for additional hardware capacity are considered to be the most significant EDP problems in the transportation sector as shown in Exhibit IV-38.
- Compared with other industry sectors, transportation uses much more of its equipment and application programming personnel resources for developing new applications than for maintaining existing programs (see Exhibit IV-39).
- Exhibit IV-40 provides a list and a ranking of the most popular methods being used in the transportation sector to reduce or improve the time and cost associated with the development of new applications.
 - The purchase of outside software and the use of on-line programming techniques comprise 55% of all mentions.

4. KEY ISSUE STATUS REVIEW

- Data base management systems of some type have been installed by one-third of the transportation industry respondents as shown in Exhibit IV-41. In those installations:
 - Two-thirds of the systems were provided by IBM, one-third by other hardware vendors, and none by independent software suppliers.
 - The level of satisfaction with the DBMS systems is only acceptable, although no respondents are evaluating alternative packages.

EXHIBIT IV-38

MOST SIGNIFICANT EDP PROBLEMS BY RESPONDENTS IN THE TRANSPORTATION SECTOR

ITEM	% OF MENTIONS
PERSONNEL AVAILABILITY AND PRODUCTIVITY	24%
NEED FOR HARDWARE MIGRATION (LACK OF CAPACITY)	19
INADEQUATE SOFTWARE AND SYSTEMS	8
NEED FOR OPERATIONS IMPROVEMENT	8
LACK OF USER INVOLVEMENT IN SYSTEM AND APPLICATION DEVELOPMENT	5
INADEQUATE STANDARDS, PROCEDURES, AND DOCUMENTATION	5
OTHER	31
<ul style="list-style-type: none"> - IMPROPER ORGANIZATION - LACK OF UNDERSTANDING BY NON-EDP MANAGEMENT - INSUFFICIENT COMMUNICATIONS CAPABILITY - LACK OF DBMS - NON-ADHERENCE TO STATED OBJECTIVES - UNSATISFACTORY PRICE PERFORMANCE - UNSATISFACTORY VENDOR SOFTWARE - INABILITY FOR REMOTE MAINTENANCE AND ON-LINE TESTING 	

EXHIBIT IV-39

USE OF RESOURCES - TRANSPORTATION SECTOR

RESOURCE UTILIZATION CATEGORIES	RESPONDENT AVERAGE
<ul style="list-style-type: none"> ● COMPUTER EQUIPMENT: <ul style="list-style-type: none"> - PRODUCTION RUNS - NEW APPLICATION DEVELOPMENT - EXISTING PROGRAM MAINTENANCE - OTHER¹ 	66% 19 11 4 <hr/> 100%
<ul style="list-style-type: none"> ● APPLICATION PROGRAMMING PERSONNEL: <ul style="list-style-type: none"> - NEW PROGRAM DEVELOPMENT - EXISTING PROGRAM MAINTENANCE - OTHER² 	56% 41 3 <hr/> 100%

OTHER MENTIONS INCLUDE:

¹TELEPROCESSING
CORPORATE USE

²CONVERSION
TELEPROCESSING AND SYSTEMS
PROGRAMMING

EXHIBIT IV-40

METHODS USED TO IMPROVE TIME AND COSTS ASSOCIATED WITH APPLICATIONS DEVELOPMENT - TRANSPORTATION SECTOR

METHOD	% OF MENTIONS
ON-LINE PROGRAMMING	33%
SOFTWARE PRODUCTS	22
STRUCTURED PROGRAMMING	11
IMPROVED STANDARDS	11
OTHER	23
<ul style="list-style-type: none"> - EDUCATION AND TRAINING - LONG-RANGE PLANNING - USER INVOLVEMENT - IMPROVED SCHEDULING 	

EXHIBIT IV-4I

DATA BASE MANAGEMENT SYSTEM STATUS FOR RESPONDENTS IN THE TRANSPORTATION SECTOR

FACTOR/CONSIDERATION IN PERCENT OF RESPONDENTS		
DBMS INSTALLED	CURRENTLY EVALUATING ALTERNATIVE DBMS	
YES 33%	YES 0%	NO 17%
NO 67%	YES 17%	NO 66%
<p>IF DBMS INSTALLED:</p> <p><u>DEVELOPER</u></p> <ul style="list-style-type: none"> ● IBM 67% ● OTHER HARDWARE 33 ● INDEPENDENT 0 <p><u>LEVEL OF SATISFACTION</u></p> <ul style="list-style-type: none"> ● SATISFIED 0% ● ACCEPTABLE 100 ● DISSATISFIED 0 ● UNKNOWN 0 <p><u>YEAR OF INSTALLATION</u></p> <ul style="list-style-type: none"> ● 1978 0% ● 1977 0 ● 1976 0 ● 1975 0 ● EARLIER 100 ● NO ANSWER 0 		

- All installations were made prior to 1976.
- Distributed data processing systems exist in none of the transportation respondent's firms. However, two-thirds are considering DDP systems, and only one-third indicate that DDP is not applicable (see Exhibit IV-42). Intended applications for this industry sector as given by respondents include:
 - Replacing standalone minis at regional locations.
 - Providing computer power at freight terminals.
 - Vehicle/rolling stock inventory.
- Exhibit IV-43 summarizes the status of various office automation involvement areas by EDP departments in transportation. Not surprisingly, the highest level of participation is in the data communications area with a reasonable level of participation in word processing. Facsimile and voice communication categories are receiving more attention than in most other industries.

EXHIBIT IV-42

RESPONDENT INVOLVEMENT IN DISTRIBUTED DATA PROCESSING-
TRANSPORTATION SECTOR

RESPONSE	PERCENT OF RESPONDENTS
DISTRIBUTED DATA PROCESSING ALREADY INSTALLED	0%
DISTRIBUTED DATA PROCESSING BEING IMPLEMENTED	0
DISTRIBUTED DATA PROCESSING UNDER CONSIDERATION	67
DISTRIBUTED DATA PROCESSING NOT APPLICABLE	33
TOTAL	100%

EXHIBIT IV-43

RESPONDENT INVOLVEMENT IN OFFICE AUTOMATION-
TRANSPORTATION SECTOR

AREA OF INVOLVEMENT	PERCENT OF RESPONDENTS		
	CURRENT	BETWEEN 1978 AND 1983	NOT BY 1983
ELECTRONIC MAIL	8%	25%	67%
WORD PROCESSING	31	46	23
COPYING/DUPLICATING	27	9	64
DATA COMMUNICATIONS	92	-	8
VOICE COMMUNICATIONS	36	22	42
FACSIMILE	36	9	55
VIDEO CONFERENCING	20	10	70

D. UTILITY

D. UTILITY

I. INDUSTRY SECTOR OVERVIEW

- The utility sector is comprised of over 20,000 establishments with nearly two million employees. The sector is dominated by telephone communications companies which employ more than 50% of the industry's personnel, and gas and electric with an additional one-third of the employees.
- Utility sector respondents generally anticipated company growth rates in keeping with overall industry growth. EDP is treated as a necessary capability but one with little or no impact on sales or company growth.
- Management attitudes toward EDP are related in large measure to the quality of service. Accordingly, topics such as reliability and improved training were discussed more frequently than new or improved technology. The attitude toward planning for a 1979 recession is "they don't usually affect us."
- Utility industry sector respondents provided 26 responses, or 5% of the total for this report. More than 80% came from gas and electric companies.
- Exhibit IV-44 provides a profile summary of respondents in the utilities sector for companies in two size categories. Unlike other sectors, there were no respondents with less than \$100 million in annual sales (revenues).
 - Three-fourths of the companies ranged in size from \$100 million to \$1 billion in annual sales. The average company in this category has annual sales (revenues) of about \$300 million, employs 2,300 people of which 66 (2.9%) are involved in EDP, and has a budget of \$2.4 million which represents about .8% of the company's annual revenues. The company budgets \$36,400 for each EDP employee and slightly more than \$1,000 per year for each of its employees for EDP expenditures.

EXHIBIT IV-44

RESPONDENT PROFILE -
UTILITIES SECTOR

PROFILE CHARACTERISTIC	COMPANY SIZE IN TERMS OF ANNUAL SALES/REVENUES		
	LESS THAN \$100 MILLION	\$100-999 MILLION	MORE THAN \$1000 MILLION
PERCENT OF RESPONDENTS	0	76%	24%
AVERAGE ANNUAL SALES	N.A.	\$302M	\$1,625M
AVERAGE TOTAL EMPLOYEES	N.A.	2,300	8,980
AVERAGE EDP EMPLOYEES	N.A.	66	187
EDP EMPLOYEES PER 100 TOTAL EMPLOYEES	N.A.	2.9	2.1
AVERAGE EDP BUDGET	N.A.	\$2.4M	\$9.0M
EDP BUDGET % OF ANNUAL SALES	N.A.	.79%	.55%
EDP BUDGET PER EDP EMPLOYEE	N.A.	\$36,400	\$48,100
EDP BUDGET PER TOTAL EMPLOYEE	N.A.	\$1,040	\$1,002

- The largest utility companies responding to INPUT's survey average \$1.6 billion in annual revenues and employ an average of 187 EDP personnel, slightly more than 2% of the total 9,000 employees. These companies reported EDP budgets which average \$9 million or .55% of total company sales. These budgets translate to EDP expenditures of \$48,000 for each EDP employee or \$1,000 for each company employee.
- Exhibit IV-45 provides a measure of the range of values for the ratio of EDP budget to total company sales (revenues) reported by utility sector respondents. The mean value for the industry is .7% compared to 1.27% for respondents across all industries.

2. BUDGET AND EXPENDITURE ANALYSIS

- EDP expenditures in the utilities sector will increase an average of 16% in 1979 according to respondents, but will continue at a somewhat lower rate through 1983. Exhibit IV-46 provides a distribution of planned budget growth for the 1978 to 1979 period and indicates a high level of growth (greater than 20%) expressed by one-half of the respondents.
- As a percentage of the total EDP budget, expenditures for small computers, communications, and software will rise steadily in 1979 and 1980. During the same period, expenditures for mainframe computers, personnel, and miscellaneous other (supplies, forms, etc.) are forecast to decrease as a percentage as indicated in Exhibit IV-47.
 - Based on the expected 16% budget increase for 1979, the absolute dollar expenditure in every budget category will be higher except in the miscellaneous other category.
- Exhibit IV-48 provides a measure of the growth of computer services and software in the utilities sector as foreseen by EDP managers. As shown, significant increases are expected in 1978 for most types of services.

EXHIBIT IV-45

DISTRIBUTION OF EDP BUDGET TO
COMPANY SALES RATIOS FOR RESPONDENTS IN THE
UTILITIES SECTOR

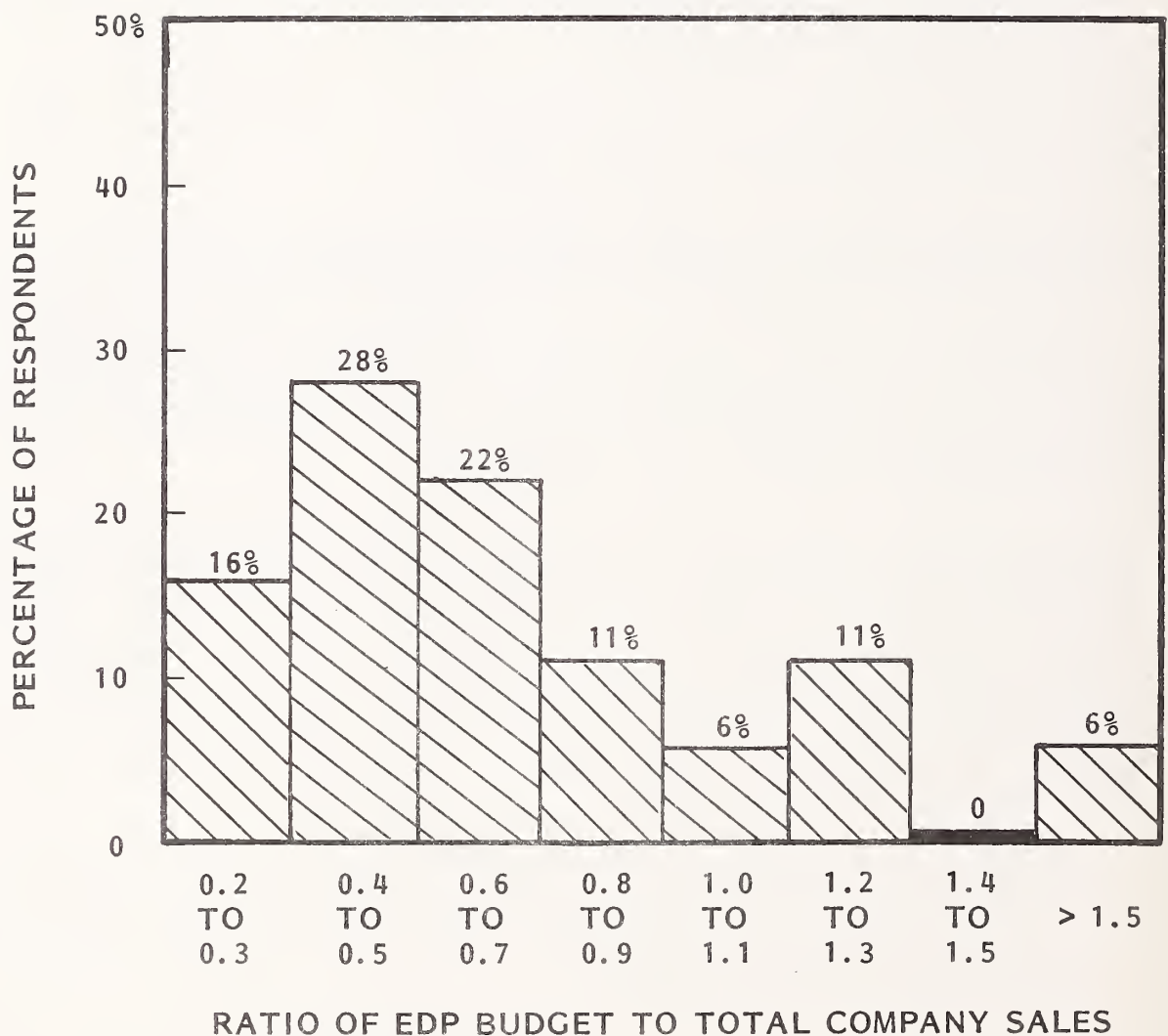


EXHIBIT IV-46

1978-1979 PLANNED EDP BUDGET GROWTH FOR RESPONDENTS- UTILITIES SECTOR

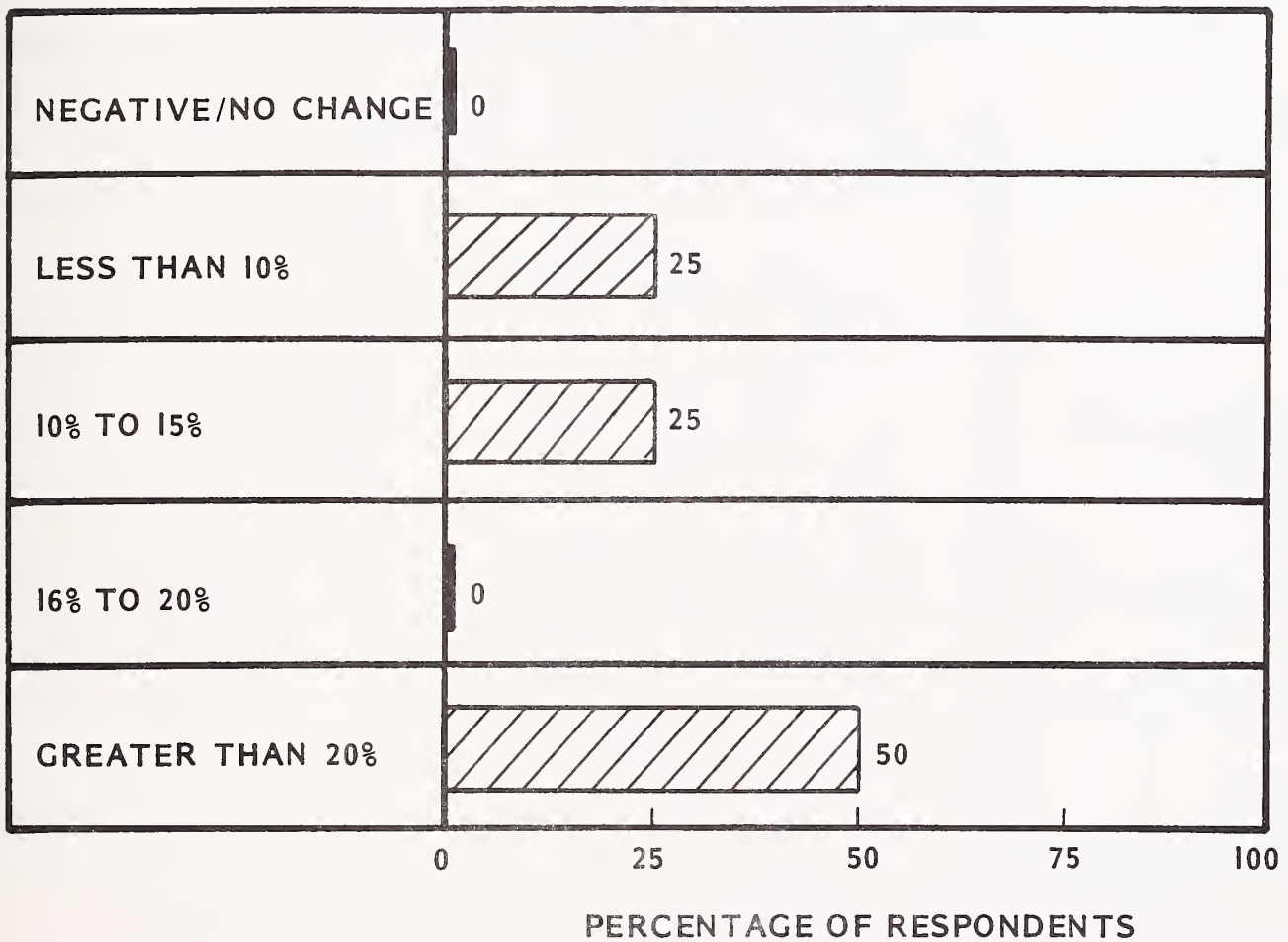


EXHIBIT IV-47

ANTICIPATED CHANGES IN EDP BUDGETS FOR RESPONDENTS IN THE
UTILITIES SECTOR

BUDGET CATEGORY	% OF TOTAL EDP BUDGET			INCREASE (DECR.) 1978 TO 1980
	1978	1979	1980	
MAIN COMPUTERS	27%	26%	25%	(7)%
SMALL COMPUTERS/ PROGRAMMABLE TERMINALS	3	4	5	67
NON-PROGRAMMABLE TERMINALS	3	3	3	0
COMMUNICATIONS	2	3	4	100
SOFTWARE (PURCHASE/LEASE)	2	3	3	50
PERSONNEL	49	44	46	(6)
OTHER	12	10	8	(33)

EXHIBIT IV-48

AVERAGE EXPENDITURES FOR SERVICES AND SOFTWARE IN THE
UTILITIES SECTOR

TYPE OF SERVICE	1977 EXPENDI- TURES AVERAGE IN \$000	1978 EXPENDI- TURES AVERAGE IN \$000	PERCENT CHANGE 1977 VS. 1978
<u>PROCESSING SERVICES</u>			
INTERACTIVE	\$404	\$440	9 %
REMOTE BATCH	11	16	45
BATCH	150	200	33
INPUT /OUTPUT	74	62	(16)
<u>SOFTWARE PRODUCTS</u>			
SYSTEMS SOFTWARE	\$ 76	\$ 85	12 %
APPLICS. SOFTWARE	45	61	36
<u>PROFESSIONAL SERVICES</u>			
CONTR. PROGRAMMING	\$204	\$101	(50)%
EDP CONSULTING	98	104	6
EDUCATION	32	38	19
OTHER	20	10	(50)
<u>FACILITIES MANAGEMENT</u>	-	-	-
<u>MAINTENANCE</u>	\$513	\$618	20%

- It should be noted that the forecasted services expenditures represent significant differences from previous INPUT forecasts. It is our opinion that control of most outside services purchases is not usually vested in the central EDP department (the source of most data contained in this report).
- The forecasts for this sector based on INPUT's study of the computer services industry for the 1977 to 1978 period shows increases of 18% for remote computing, 32% for batch services, 15% for software products, 12% for professional services, and 18% overall.

3. MAJOR PLANS AND PROBLEMS

- Study respondents who were visited or contacted by telephone for this study were asked to rank the importance of certain EDP/communications factors. As shown in Exhibit IV-49, the most important factors in the utilities sector were personnel availability and productivity and the use of office computers.
- All respondents to this study were queried regarding major EDP objectives for 1978, 1979, and 1980. Exhibit IV-50 summarizes their responses and provides a ranking based on the number of mentions for major categories.
 - On-line application development remained at a high level through 1980, accounting for nearly 20% of all mentions.
 - The implementation of data base and distributed data processing systems doubles as a combined percentage of mention in 1980.
 - The installation and upgrade of mainframes pick up as an objective in 1980, consistent with the expected high delivery rates of large scale systems among respondents.

EXHIBIT IV-49

IMPORTANCE OF EDP/COMMUNICATION FACTORS RANKED
BY RESPONDENTS IN THE UTILITIES SECTOR

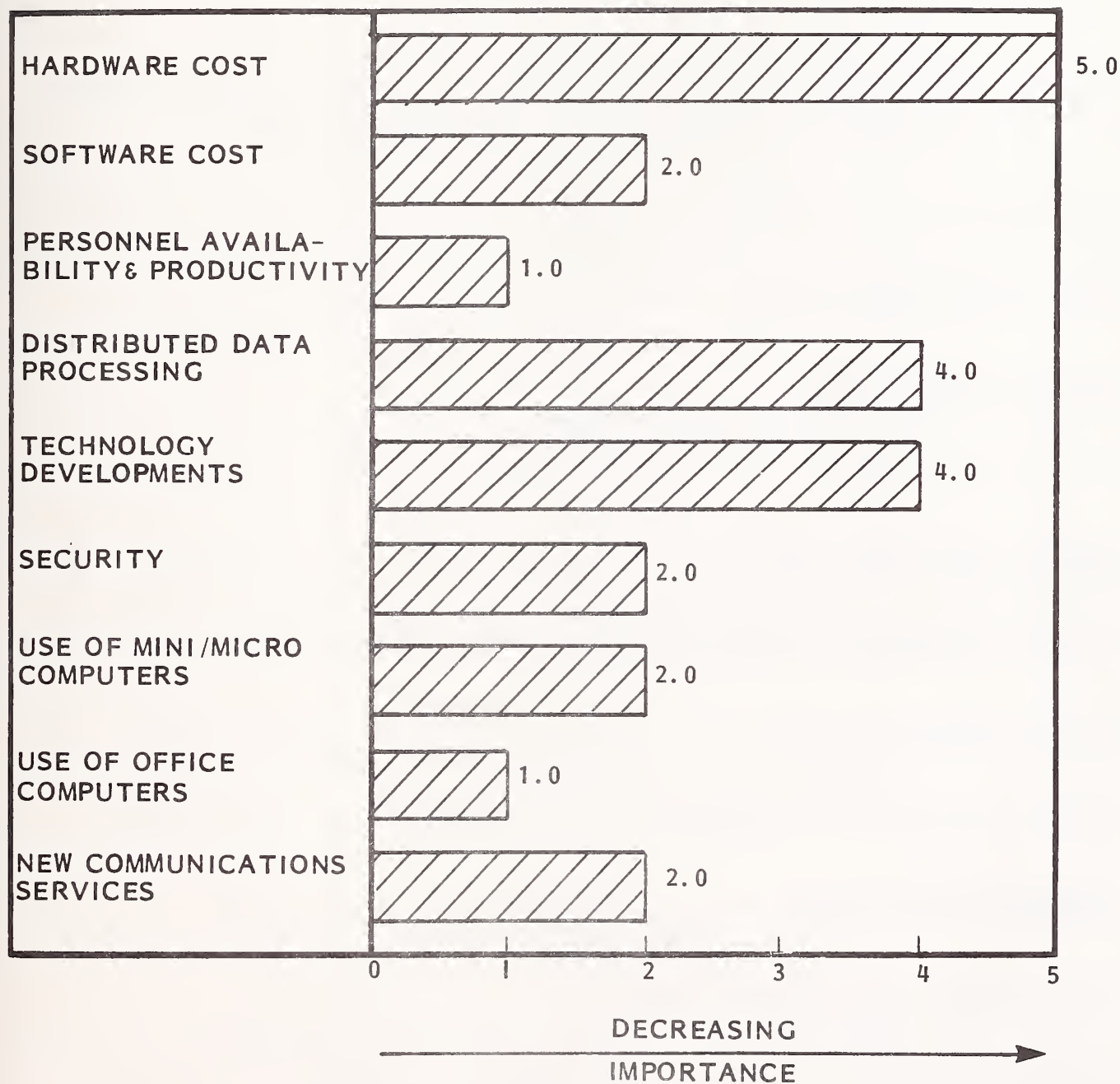


EXHIBIT IV-50

EDP OBJECTIVES FOR RESPONDENTS IN THE UTILITIES SECTOR

OBJECTIVE	PERCENT OF MENTIONS		
	1978	1979	1980
DATA BASE DEVELOPMENT	11%	10%	14%
DESIGN/INSTALL DDP	4	5	19
NEW APPLICATIONS	14	24	10
ON-LINE APPLICATIONS	11	24	19
INSTALL/UPGRADE MAINFRAME	11	14	19
INSTALL MINIS	4	5	5
INSTALL OPERATING SYSTEM	0	0	0
IMPROVE OPERATIONS	18	5	0
CENTRALIZE (OR DECENTRALIZE)	7	10	0
OTHER*	20 100%	3 100%	14 100%
TOTAL MENTIONS	28	21	21

*SPECIFIC RESPONSES INCLUDE:

- Long Range Planning
- Communications Network
- Install Word Processor

- Exhibit IV-51 provides an indication of the applications being planned and developed by the utilities sector, together with an indication of which applications are considered to be of highest priority.
 - Accounting/finance and data base applications rank high both in the number of mentions and the level of priority.
 - Financial and administrative applications received one-half of the total mentions far outpacing marketing and technically oriented applications.
- Personnel availability and productivity and the need for improved operations are considered to be the most significant EDP problems in the utilities sector as shown in Exhibit IV-52.
 - This represents a change from 1976 when data base implementation was given as the most significant problem.
- Consistent with most other industry sectors, the utilities sector uses nearly as much of its equipment and application programming personnel resources for maintaining existing programs as developing new ones (see Exhibit IV-53).
- Exhibit IV-54 provides a list and ranking of the most popular methods being used in the transportation sector to reduce or improve the time and cost associated with the development of new applications.
 - The purchase of outside software and the use of on-line programming techniques comprise 50% of all mentions.
- The expected increase in expenditures for communications and terminal devices through 1980 in the utilities sector is further clarified by analyzing the reasons for terminal installation for the same period. Exhibit IV-55 provides such an analysis.

EXHIBIT IV-5I

APPLICATIONS TO BE DEVELOPED BY RESPONDENTS IN THE UTILITIES SECTOR

APPLICATION	PERCENT OF MENTIONS	% OF MENTIONS AS HIGHEST PRIORITY
ACCOUNTING/FINANCE	17%	23%
COST SYSTEMS	3	0
INVENTORY CONTROL	11	15
ORDER ENTRY/BILLING	5	8
PERSONNEL/PAYROLL	11	8
PURCHASING	2	8
MARKETING/SALES	0	0
MODELING/FORECASTING	9	0
COMMUNICATIONS	0	0
GRAPHICS	0	0
SCIENTIFIC/ENGINEERING	3	0
DATA BASE	19	23
ELECTRONIC MAIL	0	0
WORD PROCESSING	0	0
PERFORMANCE MEASUREMENT	0	0
OTHER* (INDUSTRY SPECIFIC)	20	15
TOTAL	100%	100%

*SPECIFIC APPLICATIONS INCLUDE:

- Distribution

EXHIBIT IV-52

MOST SIGNIFICANT EDP PROBLEMS BY RESPONDENTS IN THE UTILITIES SECTOR

ITEM	% OF MENTIONS
PERSONNEL AVAILABILITY AND PRODUCTIVITY	23%
NEED FOR IMPROVED OPERATIONS	23
LACK OF USER INVOLVEMENT IN SYSTEM DEVELOPMENT	10
LACK OF LONG-RANGE EDP PLANS	10
EQUIPMENT/CAPACITY UPGRADE	7
NEED FOR REVISED EDP ORGANIZATION	7
INADEQUATE PROJECT MANAGEMENT AND CONTROL SYSTEMS	5
OTHER	15
<ul style="list-style-type: none"> - LACK OF DOCUMENTATION AND STANDARDS - INSUFFICIENT COMMUNICATIONS NETWORK - NEED FOR IMPROVED SOFTWARE 	

EXHIBIT IV-53

USE OF RESOURCES - UTILITIES SECTOR

RESOURCE UTILIZATION CATEGORIES	RESPONDENT AVERAGE
<ul style="list-style-type: none"> ● COMPUTER EQUIPMENT : <ul style="list-style-type: none"> - PRODUCTION RUNS - NEW APPLICATION DEVELOPMENT - EXISTING PROGRAM MAINTENANCE - OTHER¹ 	<div>67%</div> <div>13</div> <div>10</div> <div>10</div> <hr/> <div>100%</div>
<ul style="list-style-type: none"> ● APPLICATION PROGRAMMING PERSONNEL: <ul style="list-style-type: none"> - NEW PROGRAM DEVELOPMENT - EXISTING PROGRAM MAINTENANCE - OTHER² 	<div>47%</div> <div>48</div> <div>5</div> <hr/> <div>100%</div>

OTHER MENTIONS INCLUDE:

¹UNUSED CAPACITY
OUTSIDE SALES
UTILITIES, LOGS, ETC.

²DATA ADMINISTRATION
EDUCATION AND TRAINING

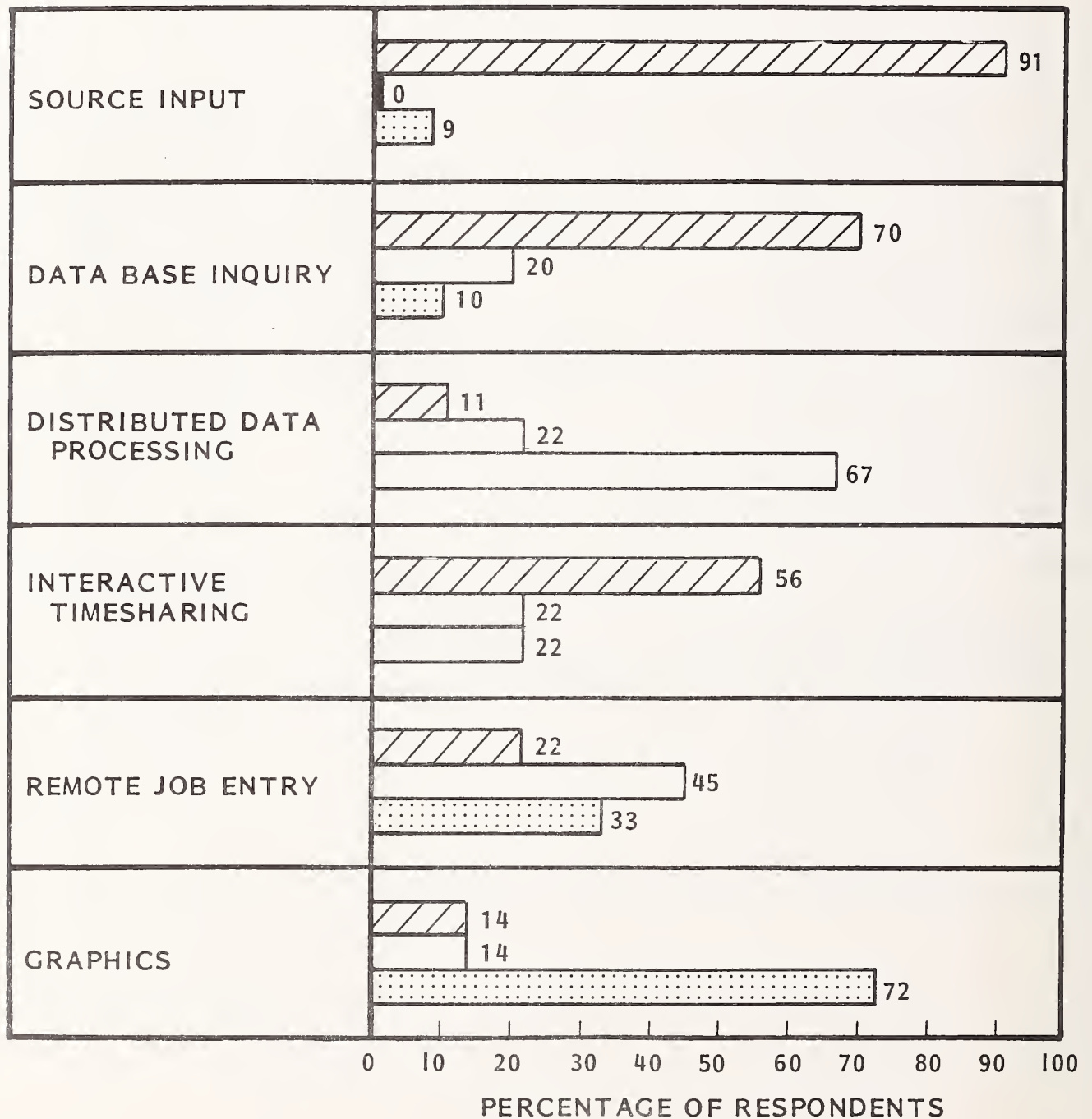
EXHIBIT IV-54




METHODS USED TO IMPROVE TIME AND COSTS ASSOCIATED WITH APPLICATIONS DEVELOPMENT - UTILITIES SECTOR

METHOD	% OF MENTIONS
ON-LINE PROGRAMMING	28%
PURCHASED SOFTWARE	21
IMPROVED STANDARDS	14
STRUCTURED PROGRAMMING	10
PROJECT MANAGEMENT SYSTEMS	10
OTHER	17
<ul style="list-style-type: none"> - HIGH LEVEL LANGUAGES - PERSONNEL EVALUATION SYSTEMS - DATA BASE MANAGEMENT SYSTEMS 	

EXHIBIT IV-55

RELATIVE IMPORTANCE OF REASONS FOR INSTALLING TERMINALS DURING THE NEXT THREE YEARS- UTILITIES SECTOR



-  = HIGH IMPORTANCE
-  = MEDIUM IMPORTANCE
-  = LOW IMPORTANCE

- Ninety-one percent of respondents indicate that source data input requirements were of high importance in terms of terminal installations for the next three years.
- Seventy percent of the respondents stated that data base inquiry was a high importance reason for installing terminals.
- Interactive timesharing is considered to be of high importance by more than one-half of the respondents. This is not the case in most other industry sectors.

4. KEY ISSUE STATUS REVIEW

- Data base management systems of some type have been installed by 45% of the utility industry respondents as shown in Exhibit IV-56. In those installations:
 - Fifty percent of the systems were provided by IBM, 50% by other hardware vendors, and none by independent software suppliers.
 - The general level of satisfaction with the DBMS systems installed is divided with half of the respondents satisfied and one-sixth dissatisfied.
 - Most of the DBMS installations were made prior to 1976.
- Distributed data processing systems exist in less than 10% of the utilities industry respondent's firms. However, nearly 75% are considering DDP systems, and only 18% indicate that DDP is not applicable (see Exhibit IV-57). DDP uses and intended applications for this industry sector as given by respondents include:
 - Remote processing in outlying plants, offices, and subsidiaries.
 - Remote front-end computing.

EXHIBIT IV-56

DATA BASE MANAGEMENT SYSTEM STATUS FOR RESPONDENTS IN THE UTILITIES SECTOR

FACTOR/CONSIDERATION IN PERCENT OF RESPONDENTS		
DBMS INSTALLED	CURRENTLY EVALUATING ALTERNATIVE DBMS	
YES 45%	YES 8%	NO 42%
NO 55%	YES 25%	NO 25%
<p>IF DBMS INSTALLED:</p> <p><u>DEVELOPER</u></p> <ul style="list-style-type: none"> ● IBM 50% ● OTHER HARDWARE 50 ● INDEPENDENT 0 <p><u>LEVEL OF SATISFACTION</u></p> <ul style="list-style-type: none"> ● SATISFIED 50% ● ACCEPTABLE 33 ● DISSATISFIED 17 ● UNKNOWN 0 <p><u>YEAR OF INSTALLATION</u></p> <ul style="list-style-type: none"> ● 1978 0% ● 1977 17 ● 1976 0 ● 1975 66 ● EARLIER 17 ● NO ANSWER 0 		

EXHIBIT IV-57

RESPONDENT INVOLVEMENT IN DISTRIBUTED DATA PROCESSING -
UTILITIES SECTOR

RESPONSE	PERCENT OF RESPONDENTS
DISTRIBUTED DATA PROCESSING ALREADY INSTALLED	9%
DISTRIBUTED DATA PROCESSING BEING IMPLEMENTED	0
DISTRIBUTED DATA PROCESSING UNDER CONSIDERATION	73
DISTRIBUTED DATA PROCESSING NOT APPLICABLE	18
TOTAL	100%

- Inquiry and file update.
- Accounting data input.
- Exhibit IV-58 summarizes the status of various office automation involvement areas by EDP departments in utilities. Not surprisingly, the highest current level of participation is in the data communications area with a high level of participation in word processing expected by 1983. Consistent with other industry sectors, video conferencing is not expected to be the subject of much attention.

EXHIBIT IV-58

RESPONDENT INVOLVEMENT IN OFFICE AUTOMATION- UTILITIES SECTOR

AREA OF INVOLVEMENT	PERCENT OF RESPONDENTS		
	CURRENT	BETWEEN 1978 AND 1983	NOT BY 1983
ELECTRONIC MAIL	- %	43%	57%
WORD PROCESSING	67	33	-
COPYING/DUPLICATING	33	11	56
DATA COMMUNICATIONS	100	-	78
VOICE COMMUNICATIONS	11	11	78
FACSIMILE	25	12	63
VIDEO CONFERENCING	-	-	100

E. WHOLESALE DISTRIBUTION

E. WHOLESALE DISTRIBUTION

I. INDUSTRY SECTOR OVERVIEW

- The wholesale distribution industry sector is overwhelmingly characterized by small establishments, 99% of which have fewer than 100 employees. In both groups that comprise the sector, durable and non-durable goods, there are fewer than 100 firms with sales exceeding \$100 million annually and none with sales of \$1 billion or more.
- Because of its structure, the primary interest in the wholesale sector for this report stems from its use of EDP and how this use parallels that found in the distribution functions of large manufacturing firms.
- Sales of merchant wholesalers in 1978 are expected to be up about 10% to \$590 billion and employment is expected to increase by 2% to 4.5 million employees. Wholesaling in the past decade has kept pace with overall economic growth: total sales as a percentage of GNP grew from 26 to almost 29%.
- Computers and computerized systems are considered to be a key to productivity in this sector and are increasingly being used to step up efficiency in both receipt and placement of orders with manufacturers.
- Wholesale distribution provided 20 responses, about 4% of the total for this study. The contributing industry groups included companies in both SIC 50 and SIC 51 categories with almost 75% coming from non-durable goods distributors.
- Exhibit IV-59 provides a profile summary of respondents in the wholesale distribution sector for companies in two size categories:

EXHIBIT IV-59

RESPONDENT PROFILE -
WHOLESALE DISTRIBUTION SECTOR

PROFILE CHARACTERISTIC	COMPANY SIZE IN TERMS OF ANNUAL SALES/REVENUES		
	LESS THAN \$100 MILLION	\$100-999 MILLION	MORE THAN \$1000 MILLION
PERCENT OF RESPONDENTS	11%	89%	0%
AVERAGE ANNUAL SALES	\$55M	\$388M	N.A.
AVERAGE TOTAL EMPLOYEES	850	2,528	N.A.
AVERAGE EDP EMPLOYEES	14	38	N.A.
EDP EMPLOYEES PER 100 TOTAL EMPLOYEES	1.6	1.5	N.A.
AVERAGE EDP BUDGET	\$0.4M	\$1.4M	N.A.
EDP BUDGET % OF ANNUAL SALES	0.7%	0.4%	N.A.
EDP BUDGET PER EDP EMPLOYEE	\$28.5K	36.8K	N.A.
EDP BUDGET PER TOTAL EMPLOYEE	\$0.5K	\$0.6K	N.A.

- Eleven percent (two companies) of the companies reported annual sales of less than \$100 million, averaging \$55 million. The average company employs 850 employees of which 14 (1.6%) are EDP personnel, and has an annual EDP budget of \$400,000 (.7% of annual sales). This translates to \$28,500 per EDP employee, and about \$500 per total company employee.
- Eighty-nine percent (17 companies) of the companies ranged in size from \$100 million to \$1 billion in annual sales. The average responding company in this category has sales of \$388 million, employs 2,500 people of which 38 (1.5%) are involved in EDP, and has an EDP budget of \$1.4 million which represents .4% of the company's annual sales.
- Exhibit IV-60 provides a measure of the range of values for the ratio of EDP budget to total company sales reported by wholesale distribution respondents. The mean value for the industry is .61% compared to 1.27 for respondents across all industries.

2. BUDGET AND EXPENDITURE ANALYSIS

- As a percentage of the total EDP budget, expenditures for small computers and programmable terminals, communications, and personnel will rise in 1979 and 1980. During the same period, expenditures for mainframe computers and miscellaneous other (supplies, forms, etc.) are forecast to decrease as a percentage as indicated in Exhibit IV-61.
- Exhibit IV-62 provides an estimate of the continuing growth of computer services and software in the process manufacturing sectors as foreseen by EDP managers. As shown, significant increases are expected in 1978 for batch processing and education services.
- It should be noted that the decline or low increase in certain processing services expenditures represent significant differences from previous INPUT forecasts. It is INPUT's opinion that control of most outside

EXHIBIT IV-60

DISTRIBUTION OF EDP BUDGET TO
COMPANY SALES RATIOS FOR RESPONDENTS IN THE
WHOLESALE DISTRIBUTION SECTOR

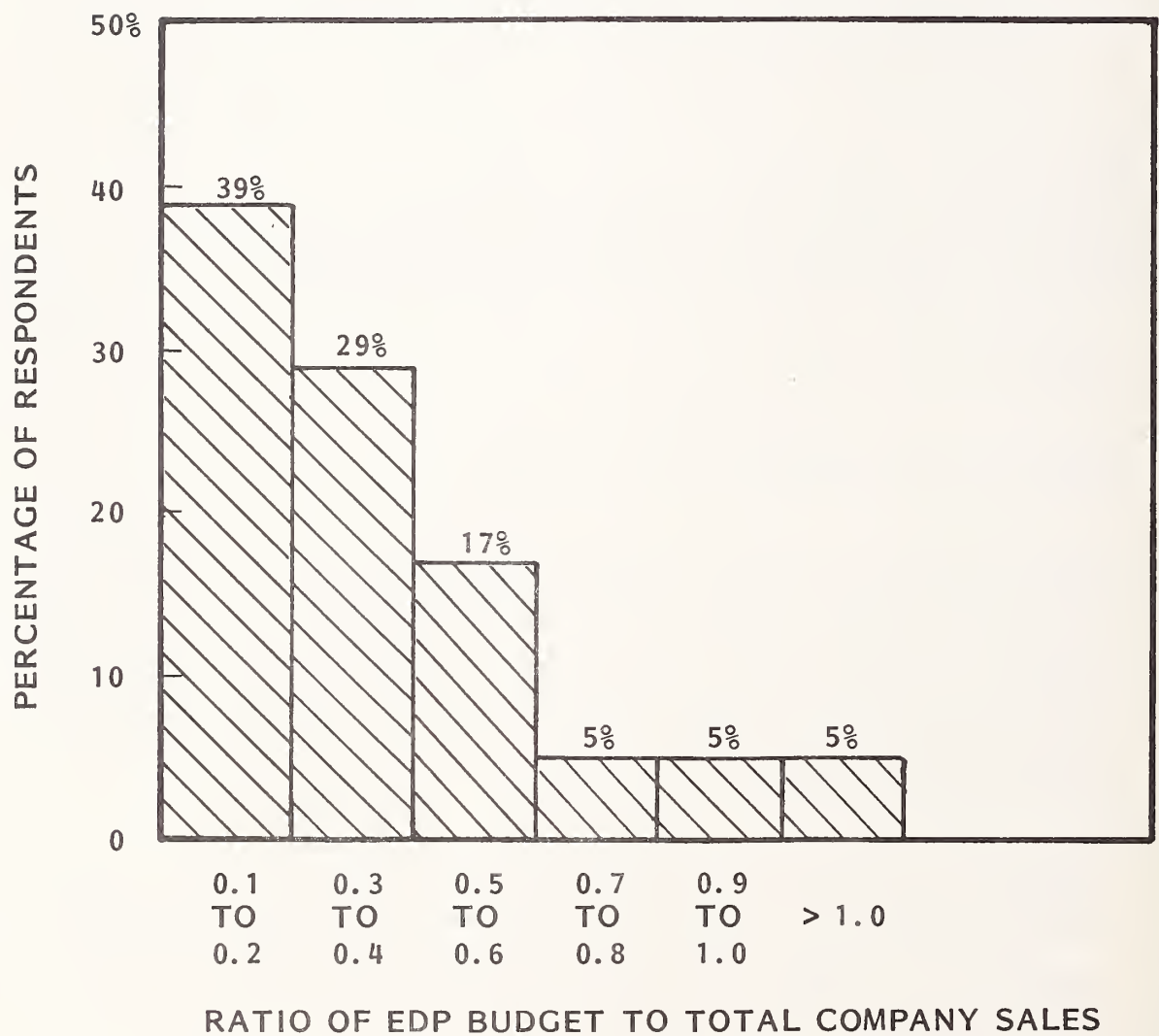


EXHIBIT IV-6I

ANTICIPATED CHANGES IN EDP BUDGETS FOR RESPONDENTS IN THE
WHOLESALE DISTRIBUTION SECTOR

BUDGET CATEGORY	% OF TOTAL EDP BUDGET			INCREASE (DECR.) 1978 TO 1980
	1978	1979	1980	
MAIN COMPUTERS	28%	27%	25%	(11)%
SMALL COMPUTERS / PROGRAMMABLE TERMINALS	2	2	4	100
NON-PROGRAMMABLE TERMINALS	4	4	4	0
COMMUNICATIONS	4	4	6	50
SOFTWARE (PURCHASE/LEASE)	4	4	4	0
PERSONNEL	45	47	47	4
OTHER	14	11	11	(21)

EXHIBIT IV-62

AVERAGE EXPENDITURES FOR SERVICES AND SOFTWARE IN THE
WHOLESALE DISTRIBUTION SECTOR

TYPE OF SERVICE	1977 EXPENDI- TURES AVERAGE IN \$000	1978 EXPENDI- TURES AVERAGE IN \$000	PERCENT CHANGE 1977 VS. 1978
<u>PROCESSING SERVICES</u>			
INTERACTIVE	\$ 43	\$ 37	(14)%
REMOTE BATCH	17	18	6
BATCH	147	200	36
INPUT/OUTPUT	9	8	(11)%
<u>SOFTWARE PRODUCTS</u>			
SYSTEMS SOFTWARE	\$ 22	\$ 30	36 %
APPLICS. SOFTWARE	32	21	(34)
<u>PROFESSIONAL SERVICES</u>			
CONTR. PROGRAMMING	\$ 34	\$ 36	6 %
EDP CONSULTING	17	4	(76)
EDUCATION	5	12	140
OTHER	6	17	183
<u>FACILITIES MANAGEMENT</u>	-	-	-
<u>MAINTENANCE</u>	46	43	(7)%

services purchases is not usually vested in the central EDP department (the source of most data contained in this report).

- Based on overall usage studies performed by INPUT for this sector, forecasts show 1978 increases of 23% for remote computing services, 12% for batch services, 19% for software products, and 14% for professional services, a total of 16% overall.

3. MAJOR PLANS AND PROBLEMS

- All respondents to this study were queried regarding major EDP objectives for 1978, 1979, and 1980. Exhibit IV-63 summarizes their responses and provides a ranking based on the number of mentions for major categories.
 - New application development and on-line application development remained at a high level through 1980, accounting for more than 50% of all mentions.
 - Despite the industry's known push to install mini computers, this is not ranked high on the objective list for any of the three years.
- Exhibit IV-64 provides an indication of the applications being planned and developed by the wholesale distribution sector, together with an indication of which applications are considered to be of highest priority.
 - Accounting/finance, inventory control and order entry applications rank high both in the number of mentions and the level of priority.
 - Financial and administrative applications received three-fourths of the total mentions, for outpacing marketing and technically oriented applications.
- Personnel availability and productivity are considered to be the most significant EDP problems in the wholesale sector as shown in Exhibit IV-65.

EXHIBIT IV-63

EDP OBJECTIVES FOR RESPONDENTS IN THE
WHOLESALE DISTRIBUTION SECTOR

OBJECTIVE	PERCENT OF MENTIONS		
	1978	1979	1980
DATA BASE DEVELOPMENT	12%	13%	9%
DESIGN/INSTALL DDP	4	8	9
NEW APPLICATIONS	12	17	36
ON-LINE APPLICATIONS	24	29	18
INSTALL/UPGRADE MAINFRAME	12	17	9
INSTALL MINIS	8	4	9
INSTALL OPERATING SYSTEM	12	0	0
IMPROVE OPERATIONS	8	0	0
CENTRALIZE (OR DECENTRALIZE)	0	4	9
OTHER*	<u>8</u> 100%	<u>8</u> 100%	<u>1</u> 100%
TOTAL MENTIONS	25	24	11

*SPECIFIC RESPONSES INCLUDE:

- Long Range Planning
- Communications Network

EXHIBIT IV-64

APPLICATIONS TO BE DEVELOPED BY RESPONDENTS IN THE WHOLESALE DISTRIBUTION SECTOR

APPLICATION	PERCENT OF MENTIONS	% OF MENTIONS AS HIGHEST PRIORITY
ACCOUNTING/FINANCE	21%	20%
COST SYSTEMS	0	0
INVENTORY CONTROL	26	47
ORDER ENTRY/BILLING	18	20
PERSONNEL/PAYROLL	5	7
PURCHASING	5	6
MARKETING/SALES	2	0
MODELING/FORECASTING	4	0
COMMUNICATIONS	0	0
GRAPHICS	0	0
SCIENTIFIC/ENGINEERING	2	0
DATA BASE	5	0
ELECTRONIC MAIL	0	0
WORD PROCESSING	0	0
PERFORMANCE MEASUREMENT	0	0
OTHER* (INDUSTRY SPECIFIC)	12	0
TOTAL	100%	100%

*SPECIFIC APPLICATIONS INCLUDE:

- Manufacturing
- Scheduling

EXHIBIT IV-65

MOST SIGNIFICANT EDP PROBLEMS BY RESPONDENTS IN THE WHOLESALE DISTRIBUTION SECTOR

ITEM	% OF MENTIONS
PERSONNEL AVAILABILITY AND PRODUCTIVITY	24%
NEED FOR TRAINING AND IMPROVED UNDERSTANDING	12
LACK OF USER INVOLVEMENT IN SYSTEM DEVELOPMENT	10
INADEQUATE SYSTEMS AND SOFTWARE	7
LACK OF MANAGEMENT UNDERSTANDING INVOLVEMENT	7
NEED FOR IMPROVED PLANNING	7
INADEQUATE PROJECT MANAGEMENT AND CONTROL SYSTEMS	7
NEED FOR COST REDUCTION OR PRICE/PERFORMANCE IMPROVEMENT	7
OTHER	19
<ul style="list-style-type: none"> - INADEQUATE DOCUMENTATION OR STANDARDS - LACK OF SUFFICIENT BUDGET - NEED FOR BETTER CHARGEBACK SYSTEM - EXCESSIVE APPLICATION DEVELOPMENT TIME 	

- Consistent with other industry respondents, the wholesale distribution sector uses nearly as much of its equipment and application programming personnel resources maintaining existing program as developing new ones (see Exhibit IV-66).
 - It should be noted that the use of computer equipment for production (74%) is one of the highest reported with several respondents indicating 85% utilization.
- Exhibit IV-67 provides a list and a ranking of the most popular methods being used in the wholesale sector to reduce or improve the time and cost associated with the development of new applications.
 - The use of on-line programming techniques comprises 27% of all mentions.
- The expected increase in expenditures for communications and terminal devices through 1980 in the wholesale sector is further clarified by analyzing the reasons for terminal installation for the same period. Exhibit IV-68 provides such an analysis.
 - Eighty-eight percent of respondents indicate that source data input requirements were of high importance in terms of terminal installations for the next three years.
 - Three-fourths of all respondents stated that data base inquiry was a high importance reason for installing terminals.
 - Interactive timesharing has dropped to the point where all respondents rank it as a low importance reason for terminal installation.

EXHIBIT IV-66

USE OF RESOURCES - WHOLESALE DISTRIBUTION SECTOR

RESOURCE UTILIZATION CATEGORIES	RESPONDENT AVERAGE
<ul style="list-style-type: none"> ● COMPUTER EQUIPMENT : <ul style="list-style-type: none"> - PRODUCTION RUNS - NEW APPLICATION DEVELOPMENT - EXISTING PROGRAM MAINTENANCE - OTHER¹ 	74% 14 11 1 <hr/> 100%
<ul style="list-style-type: none"> ● APPLICATION PROGRAMMING PERSONNEL: <ul style="list-style-type: none"> - NEW PROGRAM DEVELOPMENT - EXISTING PROGRAM MAINTENANCE - OTHER² 	50% 43 7 <hr/> 100%

OTHER MENTIONS INCLUDE:

¹SYSTEMS WORK

²ADMINISTRATION
O.S. CONVERSION

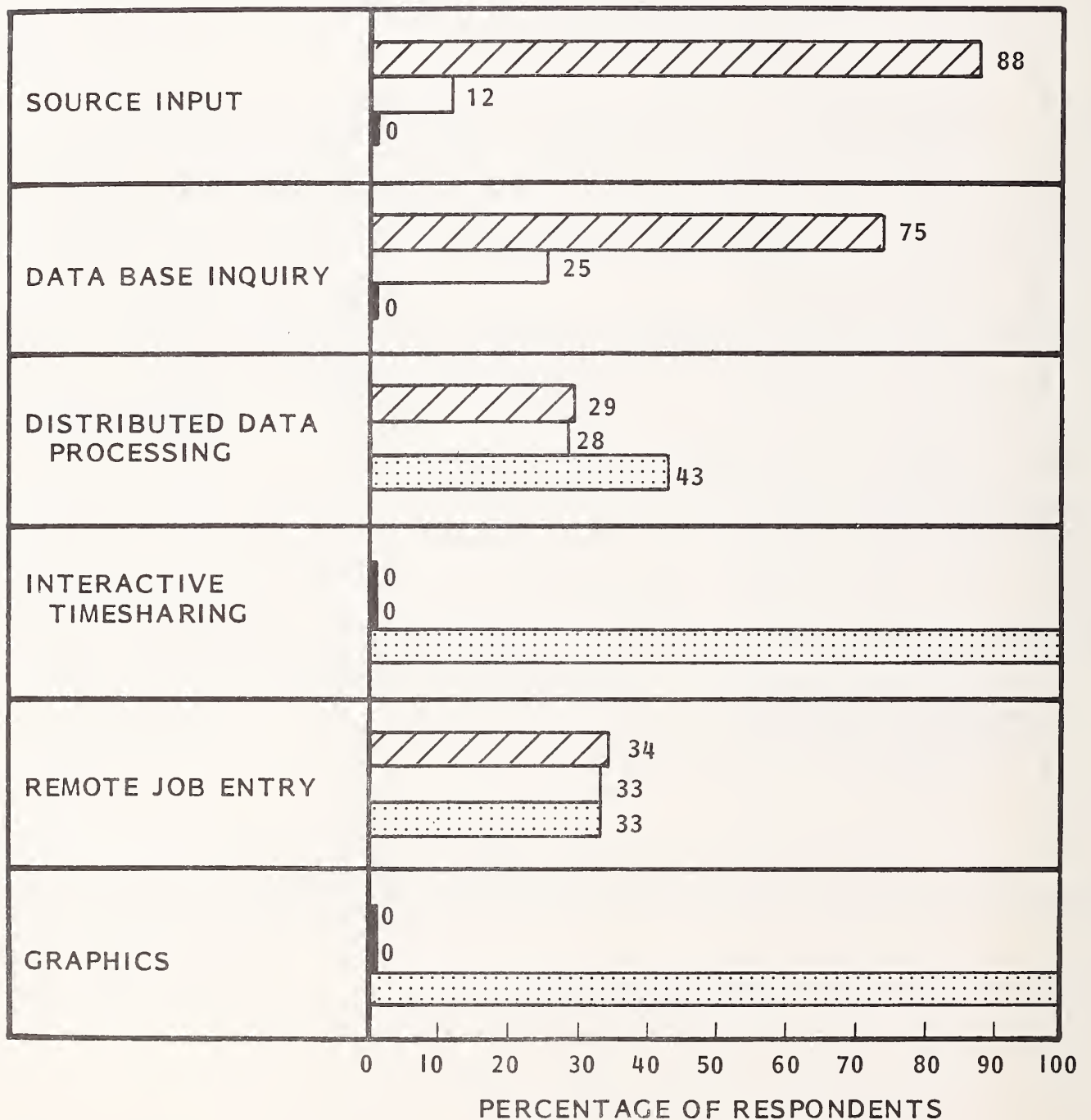
EXHIBIT IV-67




METHODS USED TO IMPROVE TIME AND COSTS ASSOCIATED WITH APPLICATIONS DEVELOPMENT - WHOLESALE DISTRIBUTION SECTOR

METHOD	% OF MENTIONS
ON-LINE PROGRAMMING	27%
PROJECT MANAGEMENT SYSTEMS	14
PURCHASED SOFTWARE	14
TRAINING AND EDUCATION	14
STRUCTURED METHODS	9
DATA BASE MANAGEMENT	9
OTHER	13
<ul style="list-style-type: none"> - USER INVOLVEMENT - IMPROVED TESTING - IMPROVED DESIGN METHODS 	

EXHIBIT IV-68

RELATIVE IMPORTANCE OF REASONS FOR INSTALLING TERMINALS DURING THE NEXT THREE YEARS - WHOLESALE DISTRIBUTION SECTOR



-  = HIGH IMPORTANCE
-  = MEDIUM IMPORTANCE
-  = LOW IMPORTANCE

4. KEY ISSUE STATUS REVIEW

- Data base management systems of some type have been installed by 50% of the wholesale respondents as shown in Exhibit IV-69. In those installations:
 - Fifty percent of the systems were provided by IBM and 50% by independent software suppliers.
 - The general level of satisfaction with the DBMS system is good, although some respondents reported dissatisfaction.
 - All of the installations were made in 1976 or earlier.
- No distributed data processing systems exist currently in any of the wholesale distribution respondents' firms. However, systems, 75% are considering DDP systems, and only 12% indicate that DDP is not applicable (see Exhibit IV-70). DDP uses and intended applications for this industry sector as given by respondents include:
 - Product distribution.
 - Perpetual inventory.
 - Distributed data base.
 - Data entry.
- Exhibit IV-71 summarizes the status of various office automation involvement areas by EDP departments in wholesale distribution. Not surprisingly, the highest level of participation is in the data communications area with a reasonable level of participation in word processing and electronic mail expected by 1983. Consistent with other industry sectors, video conferencing is not expected to be the subject of much attention.

EXHIBIT IV-69

DATA BASE MANAGEMENT SYSTEM STATUS FOR RESPONDENTS IN THE WHOLESALE DISTRIBUTION SECTOR

FACTOR/CONSIDERATION IN PERCENT OF RESPONDENTS		
DBMS INSTALLED	CURRENTLY EVALUATING ALTERNATIVE DBMS	
YES 50%	YES 0%	NO 50%
NO 50%	YES 25%	NO 25%
<p>IF DBMS INSTALLED:</p> <p><u>DEVELOPER</u></p> <ul style="list-style-type: none"> ● IBM 50% ● OTHER HARDWARE 0 ● INDEPENDENT 50 <p><u>LEVEL OF SATISFACTION</u></p> <ul style="list-style-type: none"> ● SATISFIED 50% ● ACCEPTABLE 25 ● DISSATISFIED 25 ● UNKNOWN 0 <p><u>YEAR OF INSTALLATION</u></p> <ul style="list-style-type: none"> ● 1978 0% ● 1977 0 ● 1976 25 ● 1975 50 ● EARLIER 25 ● NO ANSWER 0 		

EXHIBIT IV-70

RESPONDENT INVOLVEMENT IN DISTRIBUTED DATA PROCESSING - WHOLESALE DISTRIBUTION SECTOR

RESPONSE	PERCENT OF RESPONDENTS
DISTRIBUTED DATA PROCESSING ALREADY INSTALLED	0%
DISTRIBUTED DATA PROCESSING BEING IMPLEMENTED	13
DISTRIBUTED DATA PROCESSING UNDER CONSIDERATION	75
DISTRIBUTED DATA PROCESSING NOT APPLICABLE	12
TOTAL	100%

EXHIBIT IV-71

RESPONDENT INVOLVEMENT IN OFFICE AUTOMATION- WHOLESALE DISTRIBUTION SECTOR

AREA OF INVOLVEMENT	PERCENT OF RESPONDENTS		
	CURRENT	BETWEEN 1978 AND 1983	NOT BY 1983
ELECTRONIC MAIL	11%	33%	56%
WORD PROCESSING	25	25	50
COPYING/DUPLICATING	22	34	44
DATA COMMUNICATIONS	82	18	-
VOICE COMMUNICATIONS	11	-	89
FACSIMILE	25	12	63
VIDEO CONFERENCING	-	-	100

F. RETAIL DISTRIBUTION

F. RETAIL DISTRIBUTION

I. INDUSTRY SECTOR OVERVIEW

- Retail sales in 1978 are expected to grow to \$785 billion, almost 10% above 1977, with the total number of establishments exceeding 1.8 million and the total number of employees exceeding 14 million for the first time.
- Although "electronics" have penetrated store operations to improve customer service and lower costs, their progress has met with resistance.
 - The instantaneous banking capability effected through retail (primarily supermarket) checkouts has been limited in large measure to check verification applications.
 - Also slow in its adoption has been computer-driven checkout scanners (CCS) because of the industry's continuing need to reassure both the consumer and labor that CCS will not be introduced at their expense.
- The anticipated 1979 growth in EDP expenditures for the retail sector parallels the expected 10% growth in retail sales. This growth is expected to be higher for the next five-year period as the level of automation increases with POS and EFTS systems receiving greater levels of acceptance.
- Responses on the importance of EDP in achieving company growth ranged from major with top priority consideration given to EDP in corporate considerations to minor in some smaller and less progressive (by their measure) firms.
- Management responses indicate that 1978 EDP plans are on budget, that 1979 plans will not be affected by any special considerations for a recession ("we couldn't get by with any less" as stated by one respondent), and that primary

concerns center on the availability of reliable new technology for implementing new systems.

- Retail distribution yielded 24 responses or 5% of the total for this study. The contributing industry groups included companies in the 52, 53, 54, 56, 58, and 59 SIC categories. More than 50% of the responses were from general merchandise firms (SIC 53) and food stores (SIC 54).
- Exhibit IV-72 provides a profile of respondents in the retail distribution sector for companies in three size categories:
 - Twelve percent (three respondents) of the companies reported annual sales of less than \$100 million, averaging \$52 million. This average company employs 720 persons of which 9 (1.2%) are EDP personnel, and has an annual EDP budget of \$200,000, (.4% of sales) which translates to \$22,200 per EDP employee and about \$300 per total company employee.
 - Sixty percent of the respondents (15 companies) ranged in size from \$100 million to \$1 billion. The average company in this category has sales of \$300 million, employs 7,700 people of which 61 (.8%) are involved in EDP, and has an EDP budget of \$1.8 million which represents .6% of the company's annual sales.
 - The largest companies responding to INPUT's study averaged nearly \$1.5 billion in annual sales and employed an average of 123 EDP personnel, slightly less than .6% of the total 21,500 employees. These companies reported EDP budgets which average \$3.8 million or about .3% of total company sales, the lowest percentage of any industry sector.
- Another observation from Exhibit IV-72 includes the fact that the EDP budget per total employee ratio of less than \$200 is the lowest of any industry sector.

EXHIBIT IV-72

RESPONDENT PROFILE - RETAIL DISTRIBUTION SECTOR

PROFILE CHARACTERISTIC	COMPANY SIZE IN TERMS OF ANNUAL SALES/REVENUES		
	LESS THAN \$100 MILLION	\$100-999 MILLION	MORE THAN \$1000 MILLION
PERCENT OF RESPONDENTS	13%	65%	22%
AVERAGE ANNUAL SALES	\$52M	\$298M	\$1475M
AVERAGE TOTAL EMPLOYEES	720	7,678	21,500
AVERAGE EDP EMPLOYEES	9	61	123
EDP EMPLOYEES PER 100 TOTAL EMPLOYEES	2.0	0.8	0.6
AVERAGE EDP BUDGET	\$0.2M	\$1.8M	\$3.8M
EDP BUDGET % OF ANNUAL SALES	0.4%	0.6%	0.3%
EDP BUDGET PER EDP EMPLOYEE	\$22.2K	\$29.5K	\$30.9K
EDP BUDGET PER TOTAL EMPLOYEE	\$0.3K	\$0.2K	\$0.2K

- Exhibit IV-73 provides a measure of the range of values for the ratio of EDP budget to total company sales reported by the retail sector respondents. The mean value for this sector is .4% compared to 1.27% for respondents across all industries.

2. BUDGET AND EXPENDITURE ANALYSIS

- EDP expenditures in the retail distribution sector will increase an average of 10% in 1979 according to respondents, but will continue at the higher rate of 12 to 15% through 1983. Exhibit IV-74 provides a distribution of planned budget growth for the 1978 to 1979 period.
- As a percentage of the total EDP budget, expenditures for small computers, communications and software will rise steadily in 1979 and 1980. During the same period, expenditures for mainframe computers, personnel, and non-programmable terminals are forecast to decrease as a percentage as indicated in Exhibit IV-75.
 - Based on the expected 10% budget increase for 1979, the absolute dollar expenditure in every budget category will be higher.
- Exhibit IV-76 provides a measure of the growth of computer services and software in the retail sector as foreseen by EDP managers. As shown, a significant decrease is expected in 1978 of 23% overall.
 - It should be noted that the decline or low increase in processing services expenditures represent significant differences from previous INPUT forecasts. It is our opinion that control of most outside services purchases is not usually vested in the central EDP department (the source of most data contained in this report).
 - While there is movement toward bringing remote computing services "in-house" which will reduce outside expenditures under EDP department control, there is still a significant increase in end user

EXHIBIT IV-73

DISTRIBUTION OF EDP BUDGET TO
COMPANY SALES RATIOS FOR RESPONDENTS IN THE
RETAIL DISTRIBUTION SECTOR

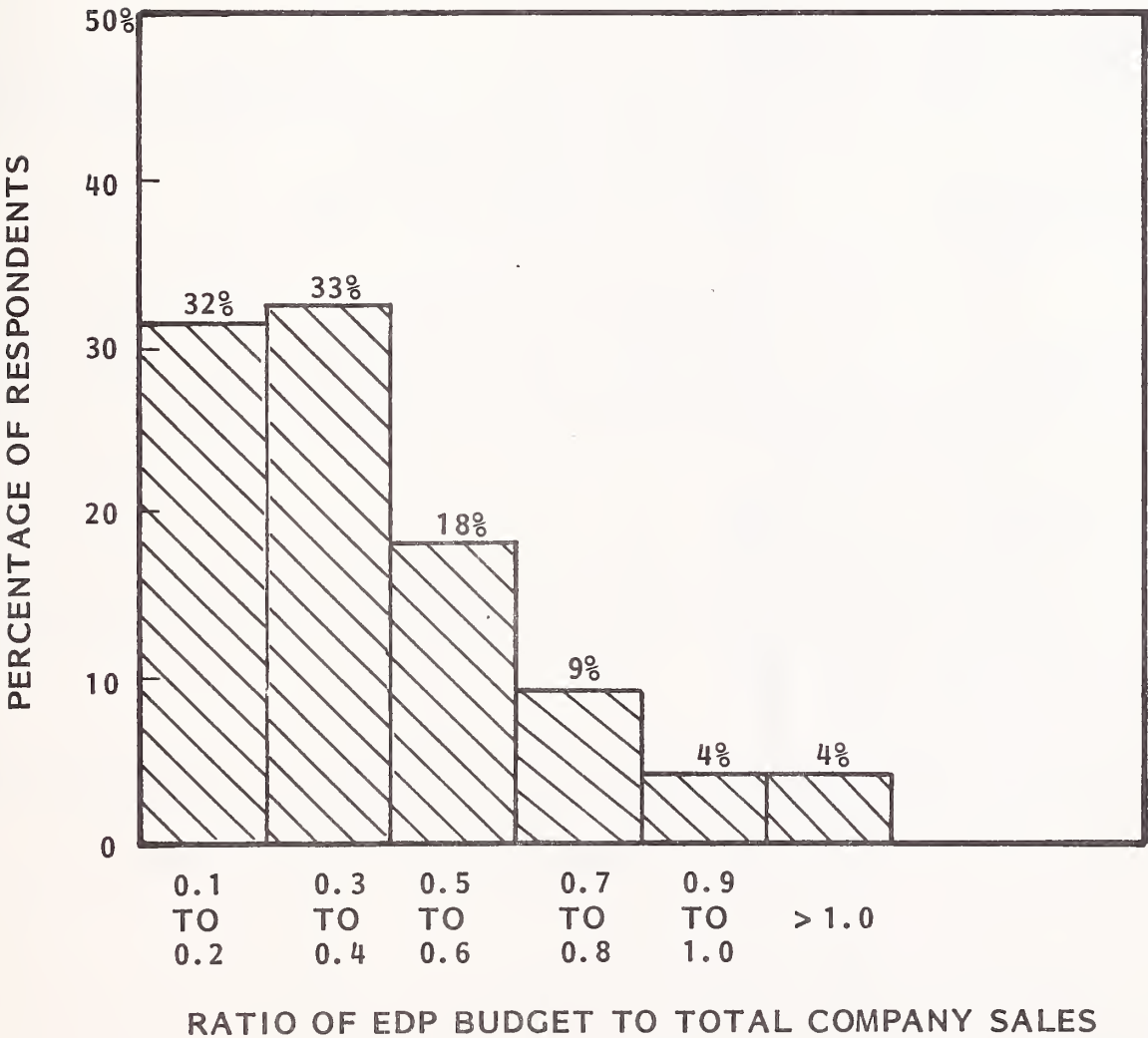


EXHIBIT IV-74

1978-1979 PLANNED EDP BUDGET GROWTH
FOR RESPONDENTS -
RETAIL DISTRIBUTION SECTOR

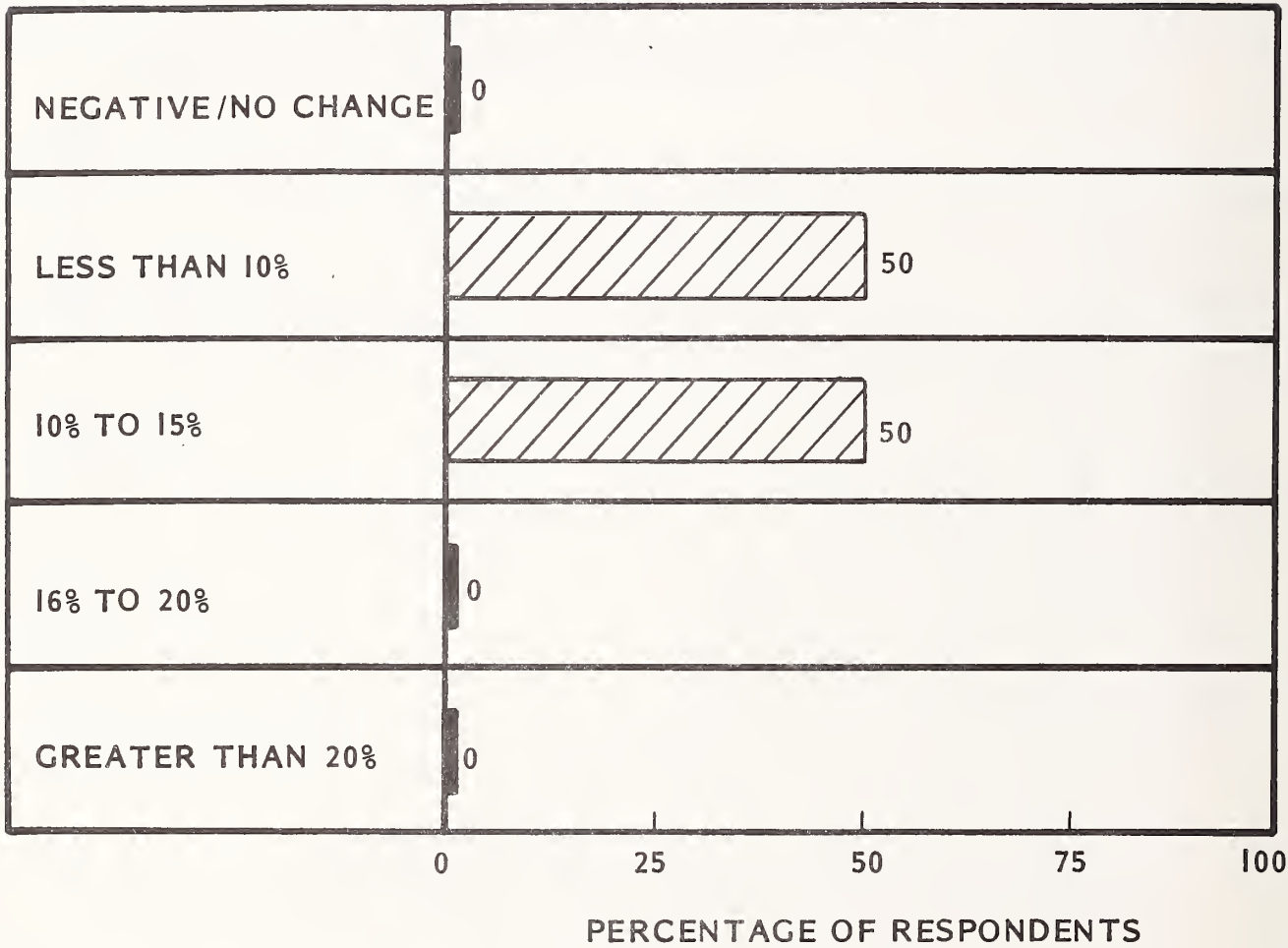


EXHIBIT IV-75

ANTICIPATED CHANGES IN EDP BUDGETS FOR RESPONDENTS IN THE RETAIL DISTRIBUTION INDUSTRY

BUDGET CATEGORY	% OF TOTAL EDP BUDGET			INCREASE (DECR.) 1978 TO 1980
	1978	1979	1980	
MAIN COMPUTERS	28%	26%	23%	(18)%
SMALL COMPUTERS/ PROGRAMMABLE TERMINALS	2	4	3	50
NON-PROGRAMMABLE TERMINALS	2	2	1	(50)
COMMUNICATIONS	2	2	4	100
SOFTWARE (PURCHASE/LEASE)	2	3	3	50
PERSONNEL	47	45	45	(4)
OTHER	16	16	19	19

EXHIBIT IV-76

AVERAGE EXPENDITURES FOR SERVICES AND SOFTWARE IN THE RETAIL DISTRIBUTION SECTOR

TYPE OF SERVICE	1977 EXPENDI- TURES AVERAGE IN \$000	1978 EXPENDI- TURES AVERAGE IN \$000	PERCENT CHANGE 1977 VS. 1978
<u>PROCESSING SERVICES</u>			
INTERACTIVE	\$143	\$ 64	(55)%
REMOTE BATCH	-	-	-
BATCH	18	20	11
INPUT /OUTPUT	30	34	13
<u>SOFTWARE PRODUCTS</u>			
SYSTEMS SOFTWARE	\$ 42	\$ 33	(21)%
APPLICS. SOFTWARE	41	34	(17)
<u>PROFESSIONAL SERVICES</u>			
CONTR. PROGRAMMING	\$114	\$124	9 %
EDP CONSULTING	41	6	(85)
EDUCATION	6	6	0
OTHER	-	-	-
<u>FACILITIES MANAGEMENT</u>	-	4	-
<u>MAINTENANCE</u>	\$ 27	\$ 31	15%

expenditure taking place as evidenced by other INPUT studies of the situation.

- Based on these other studies, INPUT forecasts for 1978 for the retail sector show increases of 22% in remote computing, 40% in software products, 25% in professional services, and 20% overall.

3. MAJOR PLANS AND PROBLEMS

- All respondents to this study were queried regarding major EDP objectives for 1978, 1979, and 1980. Exhibit IV-77 summarizes their responses and provides a ranking based on the number of mentions for major categories.
 - New application development and on-line application development remained at a high level through 1980, accounting for 45% of all mentions.
 - The implementation of data base and distributed data processing systems is surprisingly lower than almost all other industry groups.
 - The installation and upgrade of mainframes picks up as an objective in 1980, consistent with the planned high delivery rates of large scale systems among respondents.
- Exhibit IV-78 provides an indication of the applications being planned and developed by the retail distribution sector, together with an indication of which applications are considered to be of highest priority.
 - Accounting/finance, inventory control, and personnel-type systems rank high both in the number of mentions and level of priority.
 - Financial and administrative applications received more than two-thirds of the total mentions far outpacing marketing and technically oriented applications.

EXHIBIT IV-77

EDP OBJECTIVES FOR RESPONDENTS IN THE RETAIL DISTRIBUTION SECTOR

OBJECTIVE	PERCENT OF MENTIONS		
	1978	1979	1980
DATA BASE DEVELOPMENT	3%	4%	10%
DESIGN/INSTALL DDP	3	0	0
NEW APPLICATIONS	21	13	25
ON-LINE APPLICATIONS	24	46	20
INSTALL/UPGRADE MAINFRAME	17	13	25
INSTALL MINIS	7	0	0
INSTALL OPERATING SYSTEM	3	0	0
IMPROVE OPERATIONS	10	17	10
CENTRALIZE (OR DECENTRALIZE)	0	0	0
OTHER*	12 100%	7 100%	10 100%
TOTAL MENTIONS	29	24	20

*SPECIFIC RESPONSES INCLUDE:

- Long Range Planning
- Communications Network

EXHIBIT IV-78

APPLICATIONS TO BE DEVELOPED BY RESPONDENTS IN THE RETAIL DISTRIBUTION SECTOR

APPLICATION	PERCENT OF MENTIONS	% OF MENTIONS AS HIGHEST PRIORITY
ACCOUNTING/FINANCE	19%	13%
COST SYSTEMS	0	0
INVENTORY CONTROL	19	19
ORDER ENTRY/BILLING	10	19
PERSONNEL/PAYROLL	16	19
PURCHASING	6	6
MARKETING/SALES	8	0
MODELING/FORECASTING	2	6
COMMUNICATIONS	0	0
GRAPHICS	0	0
SCIENTIFIC/ENGINEERING	0	0
DATA BASE	5	0
ELECTRONIC MAIL	0	0
WORD PROCESSING	0	0
PERFORMANCE MEASUREMENT	0	0
OTHER* (INDUSTRY SPECIFIC)	15	18
TOTAL	100%	100%

*SPECIFIC APPLICATIONS INCLUDE:

- Point of Sale
- Energy Control
- Distribution

- Personnel availability and productivity are considered to be the most significant EDP problems in the retail sector as shown in Exhibit IV-79.
 - This represents a change from 1976 when costs, lack of standards and difficulty in handling data bases were given as the most significant problems.
- Consistent with other industry respondents, the retail sector uses nearly as much of its equipment and application programming personnel resources maintaining existing program as developing new ones (see Exhibit IV-80).
- Exhibit IV-81 provides a list and a ranking of the most popular methods being used in the process manufacturing sector to reduce or improve the time and cost associated with the development of new applications.
 - The improved planning and the use of on-line programming techniques comprise more than 35% of all mentions.
- The expected increase in expenditures for communications and terminal devices through 1980 in the retail sector is clarified by analyzing the reasons for terminal installation for the same period. Exhibit IV-82 provides such an analysis.
 - Seventy-five percent of respondents indicate that source data input requirements were of high importance in terms of terminal installations for the next three years.
 - One-half of all respondents stated that data base inquiry and remote job entry were high importance reasons for installing terminals.
 - Interactive timesharing has dropped to the point where two-thirds of the respondents ranked it as a low importance reason for terminal installation.

EXHIBIT IV-79

MOST SIGNIFICANT EDP PROBLEMS BY RESPONDENTS IN THE RETAIL DISTRIBUTION SECTOR

ITEM	% OF MENTIONS
PERSONNEL AVAILABILITY AND PRODUCTIVITY	17%
LACK OF MANAGEMENT UNDERSTANDING OR INVOLVEMENT	13
INADEQUATE PLANNING METHODOLOGY	13
LACK OF USER INVOLVEMENT IN SYSTEM AND APPLICATION DEVELOPMENT	10
NEED FOR IMPROVED OPERATIONS	10
OTHER	37
<ul style="list-style-type: none"> - INADEQUATE SYSTEMS AND SOFTWARE - EXCESSIVE APPLICATION DEVELOPMENT AND MAINTENANCE TIME - NEED FOR IMPROVED DOCUMENTATION - NEED FOR COST IMPROVEMENT - LACK OF METHOD FOR JUSTIFYING LOW ROI PROJECTS - INADEQUATE ORGANIZATION - NEED FOR BETTER SERVICE BY VENDORS 	

EXHIBIT IV-80

USE OF RESOURCES - RETAIL DISTRIBUTION SECTOR

RESOURCE UTILIZATION CATEGORIES	RESPONDENT AVERAGE
<ul style="list-style-type: none"> ● COMPUTER EQUIPMENT: <ul style="list-style-type: none"> - PRODUCTION RUNS - NEW APPLICATION DEVELOPMENT - EXISTING PROGRAM MAINTENANCE - OTHER¹ 	<div>73%</div> <div>14</div> <div>13</div> <div>0</div> <hr/> <div>100%</div>
<ul style="list-style-type: none"> ● APPLICATION PROGRAMMING PERSONNEL: <ul style="list-style-type: none"> - NEW PROGRAM DEVELOPMENT - EXISTING PROGRAM MAINTENANCE - OTHER² 	<div>56%</div> <div>43</div> <div>1</div> <hr/> <div>100%</div>

OTHER MENTIONS INCLUDE:

¹ TRAINING
SYSTEMS SUPPORT

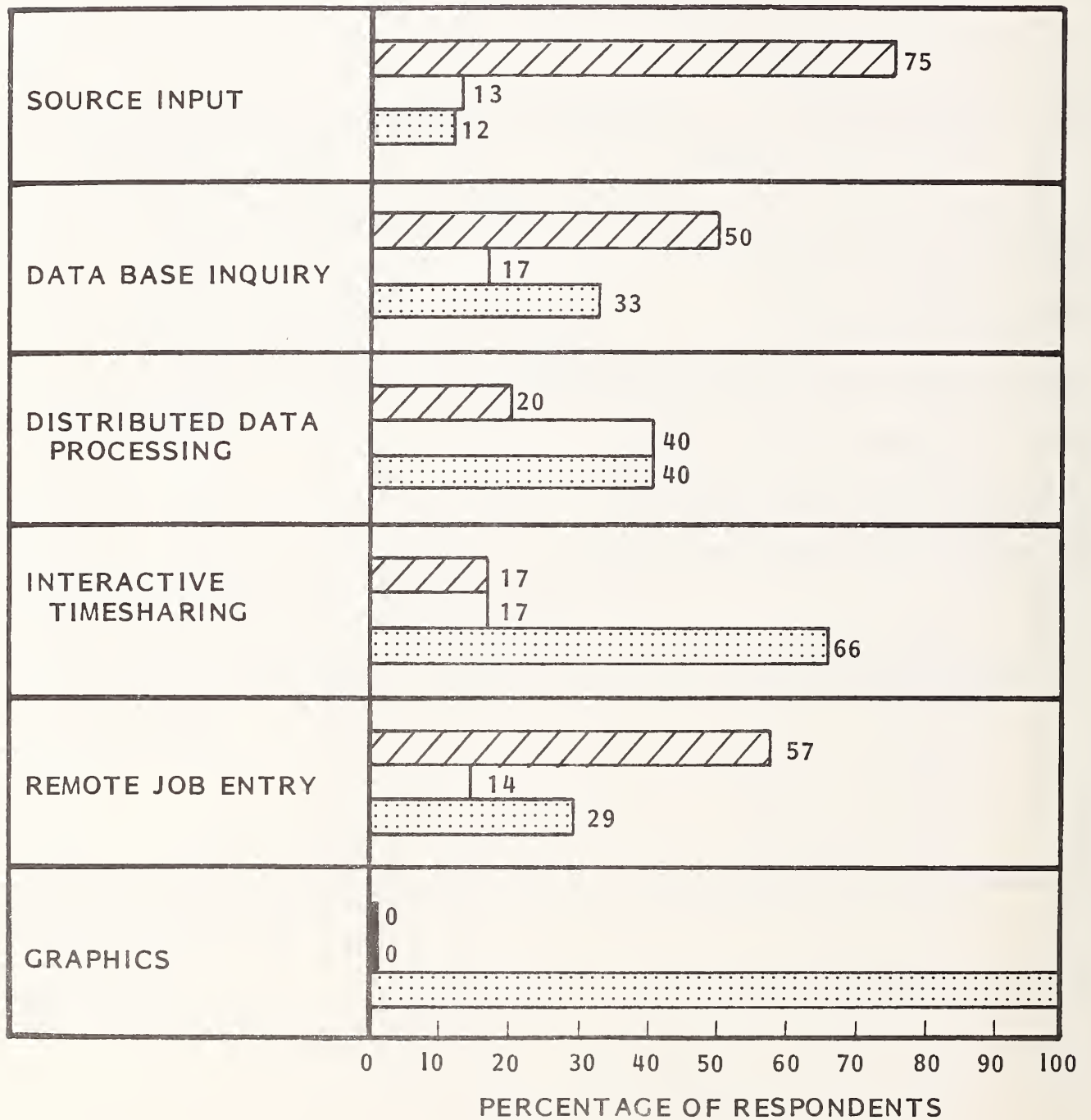
EXHIBIT IV-81




METHODS USED TO IMPROVE TIME AND COSTS ASSOCIATED WITH APPLICATIONS DEVELOPMENT- RETAIL DISTRIBUTION SECTOR

METHOD	% OF MENTIONS
ON-LINE PROGRAMMING	18%
IMPROVED PLANNING	18
STRUCTURED PROGRAMMING METHODS	18
PROJECT MANAGEMENT SYSTEMS	14
IMPROVED USER PARTICIPATION	14
PURCHASED SOFTWARE PACKAGES	9
OTHER	9
- IMPROVED ORGANIZATION	
- TRAINING	

EXHIBIT IV- 82

RELATIVE IMPORTANCE OF REASONS FOR INSTALLING TERMINALS DURING THE NEXT THREE YEARS - RETAIL DISTRIBUTION SECTOR



-  = HIGH IMPORTANCE
-  = MEDIUM IMPORTANCE
-  = LOW IMPORTANCE

4. KEY ISSUE STATUS REVIEW

- Data base management systems have been installed by 38% of the retail respondents as shown in Exhibit IV-83. In those installations:
 - One hundred percent of the systems were provided by IBM, and none by independent software suppliers. However, 13% are evaluating alternatives.
 - The general level of satisfaction with the DBMS system is split with one-third satisfied and one-third dissatisfied.
 - Most of the installations were made since 1976.
- Distributed data processing systems exist in 13% of the retail distribution respondent's firms. In addition, 38% of the respondents are considering DDP systems. Forty-nine percent indicate that DDP is not applicable (see Exhibit IV-84). DDP applications for this industry sector as given by respondents include remote store processing and terminal replacement.
- Exhibit IV-85 summarizes the status of various office automation involvement areas by EDP departments in retail distribution. Not surprisingly, the highest level of participation is in the data communication area with a reasonable level of participation in word processing (about 50%) expected by 1983. Consistent with other industry sectors, video conferencing is not expected to be the subject of much attention.

EXHIBIT IV- 83

DATA BASE MANAGEMENT SYSTEM STATUS FOR RESPONDENTS IN THE RETAIL DISTRIBUTION SECTOR

FACTOR/CONSIDERATION IN PERCENT OF RESPONDENTS		
DBMS INSTALLED	CURRENTLY EVALUATING ALTERNATIVE DBMS	
YES 38%	YES 13%	NO 25%
NO 62%	YES 37%	NO 25%
<p>IF DBMS INSTALLED:</p> <p><u>DEVELOPER</u></p> <ul style="list-style-type: none"> ● IBM 100% ● OTHER HARDWARE 0 ● INDEPENDENT 0 <p><u>LEVEL OF SATISFACTION</u></p> <ul style="list-style-type: none"> ● SATISFIED 33% ● ACCEPTABLE 33 ● DISSATISFIED 34 ● UNKNOWN 0 <p><u>YEAR OF INSTALLATION</u></p> <ul style="list-style-type: none"> ● 1978 0% ● 1977 67 ● 1976 0 ● 1975 33 ● EARLIER 0 ● NO ANSWER 0 		

EXHIBIT IV- 84

RESPONDENT INVOLVEMENT IN DISTRIBUTED DATA PROCESSING-
RETAIL DISTRIBUTION SECTOR

RESPONSE	PERCENT OF RESPONDENTS
DISTRIBUTED DATA PROCESSING ALREADY INSTALLED	13%
DISTRIBUTED DATA PROCESSING BEING IMPLEMENTED	0
DISTRIBUTED DATA PROCESSING UNDER CONSIDERATION	38
DISTRIBUTED DATA PROCESSING NOT APPLICABLE	49
TOTAL	100%

EXHIBIT IV- 85

RESPONDENT INVOLVEMENT IN OFFICE AUTOMATION-
RETAIL DISTRIBUTION SECTOR

AREA OF INVOLVEMENT	PERCENT OF RESPONDENTS		
	CURRENT	BETWEEN 1978 AND 1983	NOT BY 1983
ELECTRONIC MAIL	- %	31%	69%
WORD PROCESSING	20	27	53
COPYING/DUPLICATING	29	7	64
DATA COMMUNICATIONS	93	7	-
VOICE COMMUNICATIONS	33	7	60
FACSIMILE	21	8	71
VIDEO CONFERENCING	-	-	100

G. BANKING AND FINANCIAL

G. BANKING AND FINANCIAL

I. INDUSTRY SECTOR OVERVIEW

- The banking and financial industry is comprised of 110,000 establishments and nearly two million people. Of these, commercial banking accounts for more than 46,000 establishments (14,700 banks and 32,000 branches) and 1.3 million employees.
- New methods and systems are leading increasingly to the development of electronic processes that will largely replace coins, currency, and checks as the most important media of economic exchange.
- As a result of the numerous changes in financial regulation and technology, competition among financial institutions continues to grow almost unabated:
 - Thrift institutions offer third-party payments and are entering new fields unrelated to housing finance.
 - Commercial banks are adopting interest-bearing demand deposits and diversifying their loan portfolios to include more consumer and mortgage loans.
 - Industrial and retailing corporations are penetrating such fields as insurance, consumer and business financing, mortgage banking and other related activities.
- With this background, financial and banking industry respondents forecast their company's growth rates to be higher than other industry sectors surveyed for this study, and generally look for higher growth than their industry is achieving.

- The importance of EDP in achieving company growth in this sector ranges from major and "couldn't be higher" to minor but nonetheless important. EDP and communications are seen as vital elements in providing effective competitive services.
- Management concerns are related to cost effectiveness and cost control issues with budgets for 1978 generally being met. Exceptions appear to exist in those cases where major conversions are cited as being in process. As with almost all respondents, this industry appears to have little concern regarding a possible recession in 1979. Only one respondent indicated that he was prepared to adjust his budget if necessary.
- Banking and finance yielded 58 responses in four different questionnaire categories, nearly 12% of the total for this report. The contributing industry groups included companies with SIC codes in the 60, 61, 62, and 67 categories. Of these, the majority were commercial banks.
- Exhibit IV-87 provides a profile summary of respondents in the banking and finance sector for companies in three size categories:
 - Twenty-eight percent of the respondents reported annual revenues (interpreted by some respondents as assets) of \$100 million or less with the average being \$39 million. This average institution employs 595 people of which 25 (4.2%) are EDP personnel, and has an annual EDP budget of \$900,000 which translates to \$36,000 per EDP employee and about \$1,500 per total company employee.
 - Almost 60% of the respondents ranged in size from \$100 million to \$1 billion. The average company in this category is \$334 million in size, employs 1,134 people of which 70 (6.2%) are involved in EDP, and has an EDP budget of \$2.1 million.
 - The largest respondents in this sector averaged \$1.6 billion in size and employ 150 EDP personnel, slightly more than 6% of the 2,400 total

EXHIBIT IV-87

RESPONDENT PROFILE -
BANKING AND FINANCE SECTOR

PROFILE CHARACTERISTIC	COMPANY SIZE IN TERMS OF ANNUAL SALES/REVENUES		
	LESS THAN \$100 MILLION	\$100-999 MILLION	MORE THAN \$1000 MILLION
PERCENT OF RESPONDENTS	13%	59%	28%
AVERAGE ANNUAL SALES	\$39M	\$334M	\$1,610M
AVERAGE TOTAL EMPLOYEES	595	1,134	2,431
AVERAGE EDP EMPLOYEES	25	70	150
EDP EMPLOYEES PER 100 TOTAL EMPLOYEES	4.2	6.2	6.2
AVERAGE EDP BUDGET	\$.9M	\$2.1M	\$5.9M
EDP BUDGET % OF ANNUAL SALES	2.3%	0.6%	0.4%
EDP BUDGET PER EDP EMPLOYEE	\$36.0K	\$30.0K	\$39.3K
EDP BUDGET PER TOTAL EMPLOYEE	\$1.5K	\$1.9K	\$2.4K

employees. These companies reported EDP budgets which average \$5.9 million.

- Additional observations from Exhibit IV-87 include:
 - The ratio of EDP employees to total company employees in this sector is second only to insurance, as is the amount of EDP budget per total employee in all size categories.
 - No commercial banks are included in the less than \$100 million size category.
- Exhibit IV-88 provides a measure of the range of values for the ratio of EDP budget to institution size reported by respondents in this sector. The mean value for the industry is less than .5% compared to 1.27% for respondents across all industries.

2. BUDGET AND EXPENDITURE ANALYSIS

- EDP expenditures in the banking and finance sector will increase an average of 14% in 1979 according to respondents, but will continue at the lower rate of 11% per year through 1983. Exhibit IV-89 provides a distribution of planned budget growth for the 1978 to 1979 period.
- As a percentage of the total EDP budget, expenditures for small computers and communications will rise steadily in 1979 and 1980. During the same period, expenditures for mainframe computers, personnel, software, and miscellaneous other (supplied, forms, etc.) are forecast to decrease as a percentage as indicated in Exhibit IV-90.
 - Based on the expected 14% budget increase for 1979, the absolute dollar expenditure in every budget category except software and non-programmable terminals will be higher.

EXHIBIT IV-88

DISTRIBUTION OF EDP BUDGET TO
COMPANY SALES RATIOS FOR RESPONDENTS IN THE
BANKING AND FINANCE SECTOR

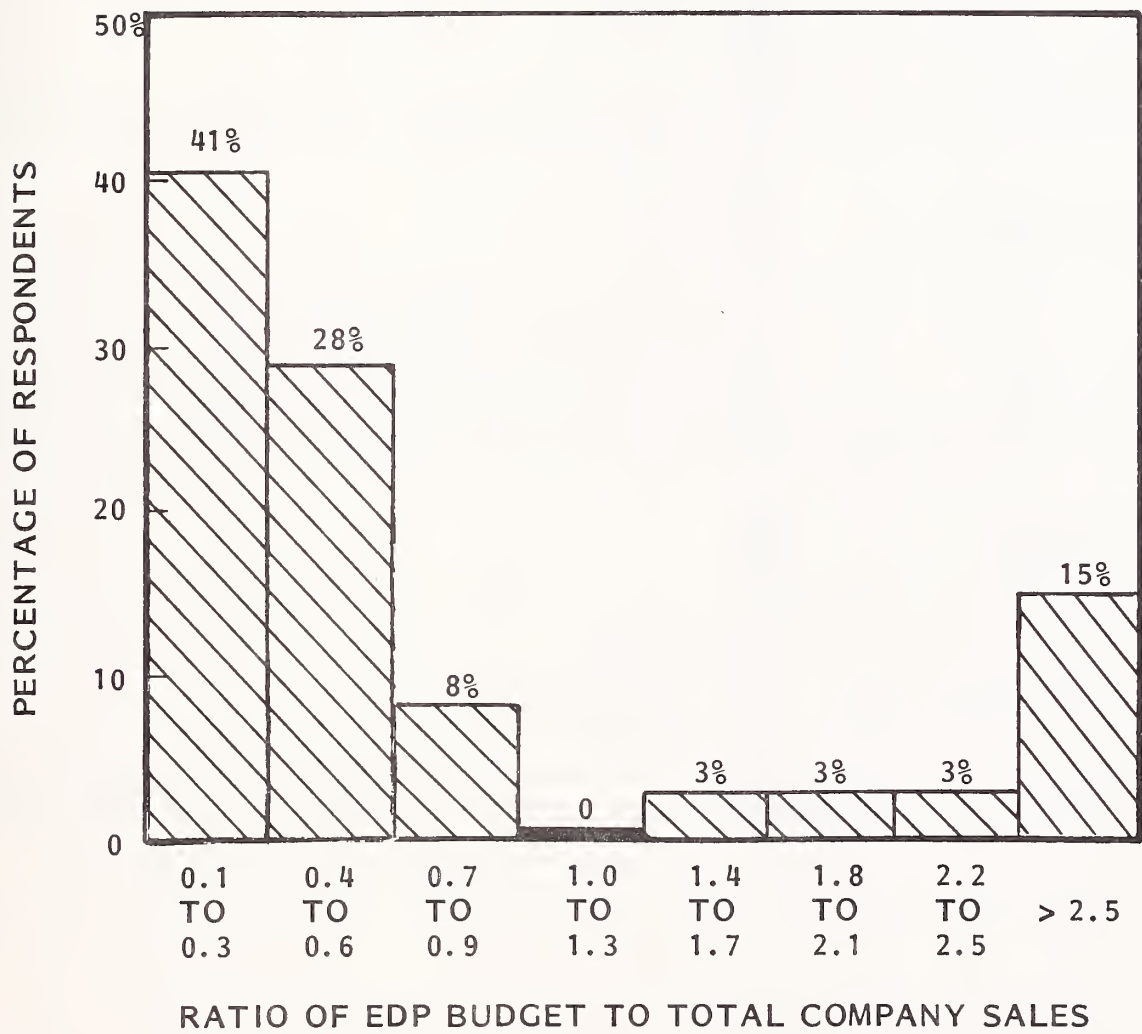


EXHIBIT IV-89

1978-1979 PLANNED EDP BUDGET GROWTH
FOR RESPONDENTS-
BANKING AND FINANCE SECTOR

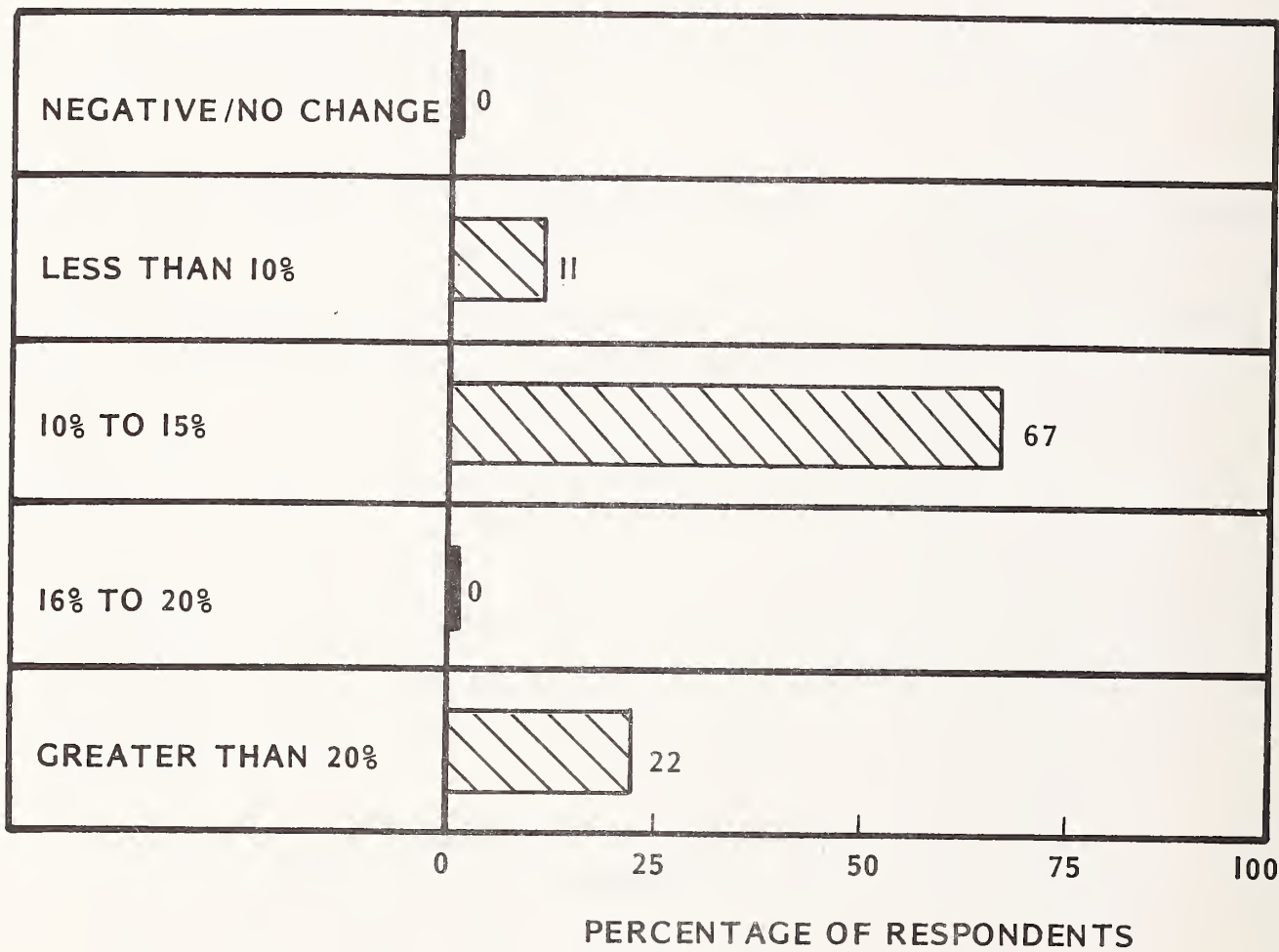


EXHIBIT IV-90

ANTICIPATED CHANGES IN EDP BUDGETS FOR RESPONDENTS IN THE BANKING AND FINANCE SECTOR

BUDGET CATEGORY	% OF TOTAL EDP BUDGET			INCREASE (DECR.) 1978 TO 1980
	1978	1979	1980	
MAIN COMPUTERS	30%	29%	25%	(17)%
SMALL COMPUTERS/ PROGRAMMABLE TERMINALS	3	4	5	67
NON-PROGRAMMABLE TERMINALS	4	3	3	(25)
COMMUNICATIONS	4	6	6	50
SOFTWARE (PURCHASE/LEASE)	5	3	3	(40)
PERSONNEL	41	40	35	(15)
OTHER	15	12	8	(47)

- Exhibit IV-91 provides a measure of the continuing growth of computer services and software in the banking and finance sector as foreseen by EDP managers. As shown, significant increases are expected in 1978 for contract programming.
- It should be noted that the decline or low increase in processing services expenditures represent significant differences from previous INPUT forecasts. It is our opinion that control of most outside services purchases is not usually vested in the central EDP department (the source of most data contained in this report).
- While there is movement toward bringing computing services "in-house" which will reduce outside expenditures under EDP department control, there is still a significant increase in end user expenditure taking place as evidenced by other INPUT studies of the situation.
- Based on INPUT's annual forecast of computer services, the banking and finance sector will experience growth from 1977 to 1978 of 28% in remote computing, 12% in batch processing, 21% in software products, 30% in professional services, and 23% overall.

3. MAJOR PLANS AND PROBLEMS

- Study respondents who were visited or contacted by telephone for this study were asked to rank the importance of certain EDP/communications factors. As shown in Exhibit IV-92, the most important factors in the banking and finance sector were personnel availability and productivity and security related.
- All respondents to this study were queried regarding major EDP objectives for 1978, 1979, and 1980. Exhibit IV-93 summarizes their responses and provides a ranking based on the number of mentions for major categories.

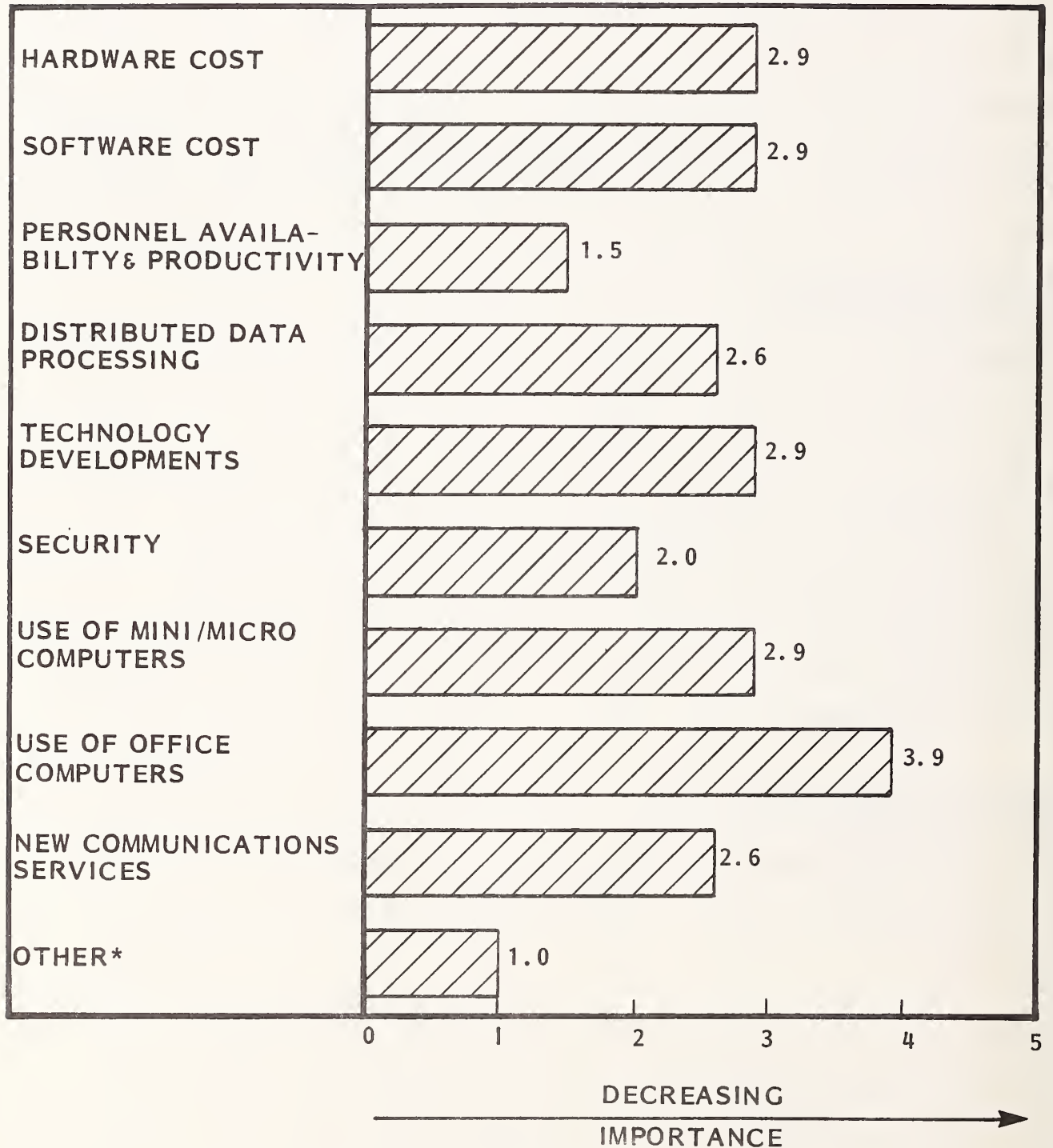
EXHIBIT IV-9I

AVERAGE EXPENDITURES FOR SERVICES AND SOFTWARE IN THE
BANKING AND FINANCE SECTOR

TYPE OF SERVICE	1977 EXPENDI- TURES AVERAGE IN \$000	1978 EXPENDI- TURES AVERAGE IN \$000	PERCENT CHANGE 1977 VS. 1978
<u>PROCESSING SERVICES</u>			
INTERACTIVE	\$ 91	\$107	18 %
REMOTE BATCH	300	263	(12)
BATCH	53	40	(25)
INPUT /OUTPUT	21	21	0
<u>SOFTWARE PRODUCTS</u>			
SYSTEMS SOFTWARE	\$ 50	\$ 46	(8)%
APPLICS. SOFTWARE	83	89	7
<u>PROFESSIONAL SERVICES</u>			
CONTR. PROGRAMMING	\$ 40	\$ 85	113 %
EDP CONSULTING	51	51	0
EDUCATION	15	18	20
OTHER	-	-	-
<u>FACILITIES MANAGEMENT</u>	-	-	-
<u>MAINTENANCE</u>	\$129	\$136	5 %

EXHIBIT IV-92

IMPORTANCE OF EDP/COMMUNICATION FACTORS RANKED
BY RESPONDENTS IN THE BANKING AND FINANCE SECTOR



*SPECIFIC FACTORS MENTIONED INCLUDE:

- QUALITY OF EDP SERVICE

EXHIBIT IV-93

EDP OBJECTIVES FOR RESPONDENTS IN THE BANKING AND FINANCE SECTOR

OBJECTIVE	PERCENT OF MENTIONS		
	1978	1979	1980
DATA BASE DEVELOPMENT	3%	8%	13%
DESIGN/INSTALL DDP	2	3	3
NEW APPLICATIONS	17	20	13
ON-LINE APPLICATIONS	29	20	31
INSTALL/UPGRADE MAINFRAME	20	20	9
INSTALL MINIS	0	0	6
INSTALL OPERATING SYSTEM	7	5	3
IMPROVE OPERATIONS	8	11	13
CENTRALIZE (OR DECENTRALIZE)	5	2	9
OTHER*	<u>9</u> 100%	<u>11</u> 100%	<u>0</u> 100%
TOTAL MENTIONS	59	61	32

*SPECIFIC RESPONSES INCLUDE:

- Long Range Planning
- Communications Network
- Install Word Processor

- New application development and on-line application development remained at a high level through 1980, accounting for at least 40% of all mentions.
 - The implementation of data base systems more than triples as a percentage of mentions in 1980.
 - The installation and upgrade of mainframes drops off as an objective in 1980, while the improvement of operations picks up.
- Exhibit IV-94 provides an indication of the applications being planned and developed by the financial sector, together with an indication of which applications are considered to be of highest priority.
 - Contrary to other industry responses, the overwhelming majority of applications to be developed are specific to the industry.
 - Personnel availability and productivity together with the need for improved operations are considered to be the two most significant EDP problems in the banking and finance sector as shown in Exhibit IV-95.
 - This is consistent with responses given in 1976 when more than one-half of respondents cited programmer productivity as the most significant problem.
 - Similar to other industry respondents, the banking and finance sector uses as much of its equipment and application programming personnel resources maintaining existing programs as developing new ones (see Exhibit IV-96).
 - Exhibit IV-97 provides a list and a ranking of the most popular methods being used in the finance sector to reduce or improve the time and cost associated with the development of new applications.

EXHIBIT IV-94

APPLICATIONS TO BE DEVELOPED BY RESPONDENTS IN THE BANKING AND FINANCE SECTOR

APPLICATION	PERCENT OF MENTIONS	% OF MENTIONS AS HIGHEST PRIORITY
ACCOUNTING/FINANCE	17%	13%
COST SYSTEMS	2	0
INVENTORY CONTROL	3	7
ORDER ENTRY/BILLING	1	0
PERSONNEL/PAYROLL	5	7
PURCHASING	0	0
MARKETING/SALES	2	0
MODELING/FORECASTING	1	0
COMMUNICATIONS	0	0
GRAPHICS	1	0
SCIENTIFIC/ENGINEERING	0	0
DATA BASE	9	7
ELECTRONIC MAIL	0	0
WORD PROCESSING	0	0
PERFORMANCE MEASUREMENT	0	0
OTHER* (INDUSTRY SPECIFIC)	59	66
TOTAL	100%	100%

*SPECIFIC APPLICATIONS INCLUDE:

- Special Banking
- Loans
- Deposit
- Personal Trust
- Branch/Teller Terminals

EXHIBIT IV-95

MOST SIGNIFICANT EDP PROBLEMS BY RESPONDENTS IN THE BANKING & FINANCE SECTOR

ITEM	% OF MENTIONS
PERSONNEL AVAILABILITY AND PRODUCTIVITY	26%
NEED FOR IMPROVED OPERATIONS	18
INADEQUATE SYSTEMS AND SOFTWARE	17
LACK OF ADEQUATE PLANNING	9
LACK OF MANAGEMENT UNDERSTANDING OR INVOLVEMENT	5
OTHER	25
<ul style="list-style-type: none"> - INADEQUATE DATA COMMUNICATIONS - LACK OF USER INTERACTION - INADEQUATE PROJECT CONTROL AND MANAGEMENT SYSTEM - NEED FOR IMPROVED STANDARDS AND DOCUMENTATION - EXCESSIVE PROGRAMMING AND PROGRAM MAINTENANCE COST - NEED FOR DBMS AND DDP INSTALLATION 	

SOURCE: EDP USER PANEL

TOTAL MENTIONS - 93

EXHIBIT IV-96

USE OF RESOURCES - BANKING AND FINANCE SECTOR

RESOURCE UTILIZATION CATEGORIES	RESPONDENT AVERAGE
<ul style="list-style-type: none"> ● COMPUTER EQUIPMENT : <ul style="list-style-type: none"> - PRODUCTION RUNS - NEW APPLICATION DEVELOPMENT - EXISTING PROGRAM MAINTENANCE - OTHER¹ 	70% 12 12 6 <hr/> 100%
<ul style="list-style-type: none"> ● APPLICATION PROGRAMMING PERSONNEL: <ul style="list-style-type: none"> - NEW PROGRAM DEVELOPMENT - EXISTING PROGRAM MAINTENANCE - OTHER² 	49% 48 3 <hr/> 100%

OTHER MENTIONS INCLUDE:

¹ RESERVE/AVAILABLE
ADMINISTRATIVE
ON-LINE SYSTEM
RERUNS
OUTSIDE SERVICES

² INSTALLATION OF PACKAGE/
SOFTWARE
ADMINISTRATIVE
TRAINING
TECHNICAL SUPPORT

EXHIBIT IV-97

METHODS USED TO IMPROVE TIME AND COSTS ASSOCIATED WITH APPLICATIONS DEVELOPMENT - BANKING AND FINANCE SECTOR

METHOD	% OF MENTIONS
ON-LINE PROGRAMMING	16%
PURCHASED SOFTWARE	16
IMPROVED PLANNING	16
TRAINING	14
STRUCTURED METHODS	12
PROJECT MANAGEMENT SYSTEMS	10
PROGRAMMING AIDS	8
OTHER	8
- USER INVOLVEMENT	
- DOCUMENTATION	

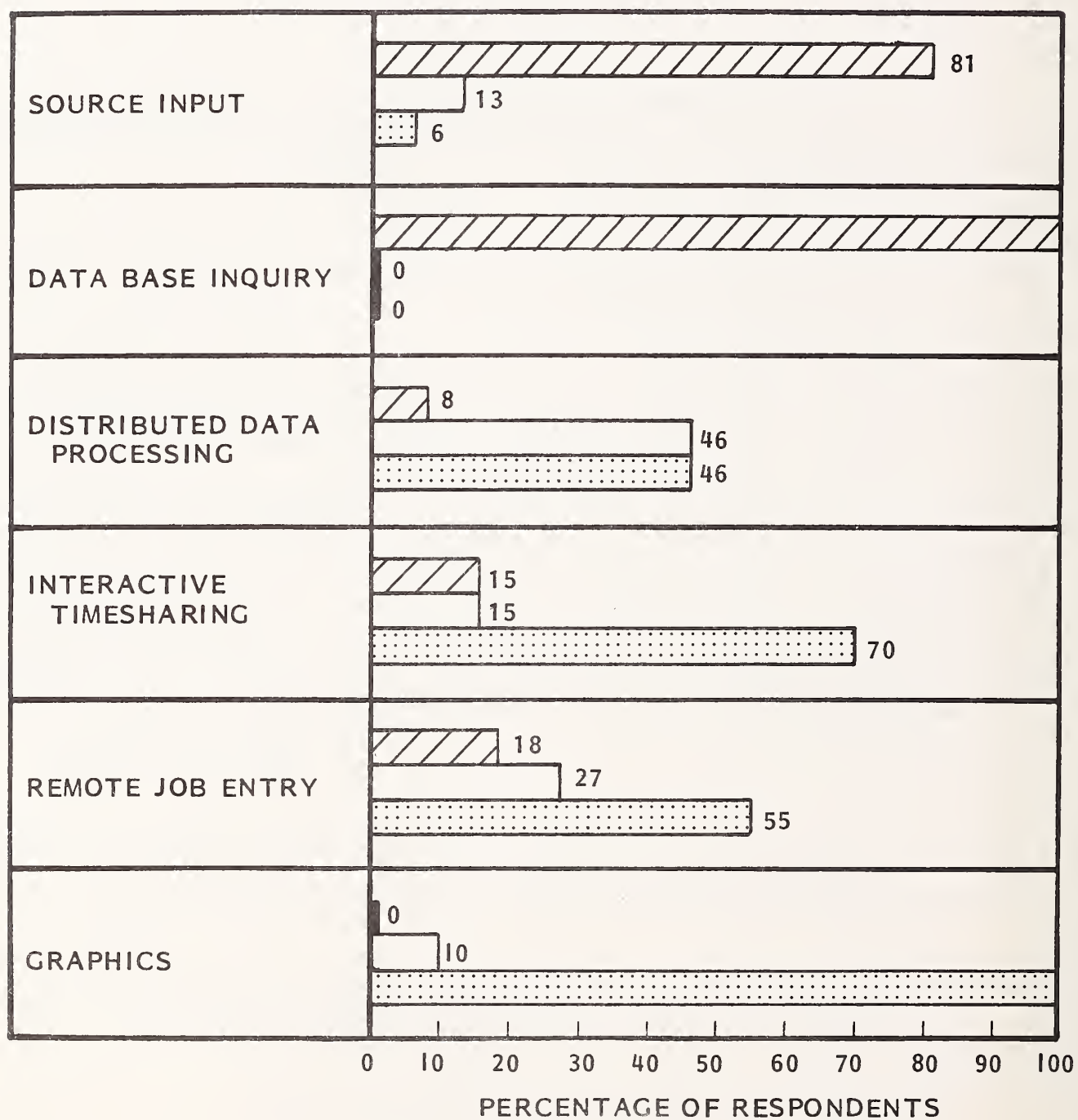
- The purchase of outside software and the use of on-line programming techniques comprise about one-third of all mentions.
- The expected increase in expenditures for communications and terminal devices through 1980 in the banking sector is clarified by analyzing the reasons for terminal installation for the same period. Exhibit IV-98 provides such an analysis:
 - Eighty-one percent of respondents indicate that source data input requirements were of high importance in terms of terminal installations for the next three years.
 - All respondents stated that data base inquiry was a high importance reason for installing terminals.
 - Interactive timesharing and remote job entry have dropped to the point where more than one-half of the respondents rank these as low importance reasons for terminal installation.

4. KEY ISSUE STATUS REVIEW

- Data base management systems have been installed by 56% of the 16 banking and finance respondents who answered a series of questions as shown in Exhibit IV-99. In those installations:
 - Twenty-two percent of the systems were provided by IBM, 11% by other hardware vendors, and 67% by independent software suppliers.
 - The general level of satisfaction with the DBMS system is good with only 6% of the existing installations evaluating alternatives.
 - Most of the installations were made prior to 1976.

EXHIBIT IV-98

RELATIVE IMPORTANCE OF REASONS FOR INSTALLING TERMINALS DURING THE NEXT THREE YEARS - BANKING AND FINANCE SECTOR






-  = HIGH IMPORTANCE
-  = MEDIUM IMPORTANCE
-  = LOW IMPORTANCE

EXHIBIT IV-99

DATA BASE MANAGEMENT SYSTEM STATUS FOR RESPONDENTS IN THE BANKING AND FINANCE SECTOR

FACTOR/CONSIDERATION IN PERCENT OF RESPONDENTS		
DBMS INSTALLED	CURRENTLY EVALUATING ALTERNATIVE DBMS	
YES 56%	YES 6%	NO 50%
NO 44%	YES 19%	NO 25%
<p>IF DBMS INSTALLED:</p> <p><u>DEVELOPER</u></p> <ul style="list-style-type: none"> ● IBM 22% ● OTHER HARDWARE 11 ● INDEPENDENT 67 <p><u>LEVEL OF SATISFACTION</u></p> <ul style="list-style-type: none"> ● SATISFIED 45% ● ACCEPTABLE 22 ● DISSATISFIED 22 ● UNKNOWN 11 <p><u>YEAR OF INSTALLATION</u></p> <ul style="list-style-type: none"> ● 1978 11% ● 1977 0 ● 1976 22 ● 1975 22 ● EARLIER 34 ● NO ANSWER 11 		

- Distributed data processing systems exist in 12% of the banking and finance respondents' firms. However, 50% are considering DDP systems, and only 25% indicate that DDP is not applicable (see Exhibit IV-100). DDP uses and intended applications for this industry sector as given by respondents include:
 - Remote processing.
 - Data entry.
- Exhibit IV-101 summarizes the status of various office automation involvement areas by EDP departments in banking and finance. Not surprisingly, the highest level of participation is in the data communications area with a reasonable level of participation in word processing (74%) expected by 1983. Consistent with other industry sectors, video conferencing is not expected to be the subject of much attention.

EXHIBIT IV-100

RESPONDENT INVOLVEMENT IN DISTRIBUTED DATA PROCESSING BANKING AND FINANCE SECTOR

RESPONSE	PERCENT OF RESPONDENTS
DISTRIBUTED DATA PROCESSING ALREADY INSTALLED	17%
DISTRIBUTED DATA PROCESSING BEING IMPLEMENTED	10
DISTRIBUTED DATA PROCESSING UNDER CONSIDERATION	50
DISTRIBUTED DATA PROCESSING NOT APPLICABLE	23
TOTAL	100%

DDP USE OR INTENDED USE:

- ON LINE
- DATA ENTRY
- REMOTE PROCESSING

EXHIBIT IV-101

RESPONDENT INVOLVEMENT IN OFFICE AUTOMATION- BANKING AND FINANCE SECTOR

AREA OF INVOLVEMENT	PERCENT OF RESPONDENTS		
	CURRENT	BETWEEN 1978 AND 1983	NOT BY 1983
ELECTRONIC MAIL	12%	16%	72%
WORD PROCESSING	42	32	26
COPYING/DUPLICATING	33	11	56
DATA COMMUNICATIONS	94	6	-
VOICE COMMUNICATIONS	34	17	49
FACSIMILE	31	3	66
VIDEO CONFERENCING	-	7	93

H. INSURANCE

H. INSURANCE

I. INDUSTRY SECTOR OVERVIEW

- The insurance industry employs more than two million people in its 90,000 establishments counting all agents, brokers, and services.
- The life insurance business, with nearly 1,800 firms, rode the crest of the general business recovery in 1976 and sustained the momentum through 1977 and into 1978. In 1977, increased personal income helped boost new life insurance purchases 11%.
- Inflation, a particular concern to the insurance industry, is putting pressure on operating costs causing companies to intensify efforts to control expenses and increase productivity. Hence, the industry continues to stress automation to handle the rising transaction volume.
- The industry is striving also to minimize policy lapsing which significantly increases selling costs, managing paperwork, and general administration. Furthermore, special customer services are increasing in an attempt to become more sensitive to consumer complaints.
- EDP is highly centralized in insurance companies. Exposure to EDP and communications by executives in this sector is likely to be second only to banking executives, if at all.
- Insurance industry respondents indicate a growth for their companies that keeps pace with their industry.
- EDP is considered to be very important in meeting growth objectives with computer/communication systems providing a competitive advantage as well as an essential basis for service reliability.

- Management concerns about computer and communications developments have a wide range and include unavailability of personnel, price increases, speed of application implementation (reaction time to management needs), and a fragmentation of control resulting from DDP. There is not expressed concern or action being taken with respect to a possible recession in 1979. 1978 budget plans are being met and in some cases are ahead of expectation.
- Insurance industry respondents provided 64 responses in four different questionnaire categories, or 13% of the total for this report. The contributing industry groups included companies with SIC codes in the 63 and 64 categories. Of these more than 90% were life insurance firms.
- Exhibit IV-102 provides a profile summary of respondents in the insurance sector for companies in three size categories:
 - Forty-five percent (29 firms) of the companies reported annual revenues of less than \$100 million, with an average of \$38 million. This average company employs 308 people of which 28 (9.1%) are EDP personnel, and has an annual EDP budget of \$700,000 (1.8% of annual revenues), which translates to \$25,000 per EDP employee and about \$2,300 for each employee in the company.
 - Fifty-three percent (34 firms) of the companies ranged in size from \$100 million to \$1 billion in annual revenues. The average company in this category is \$304 million, employs 1,640 people of which 120 (7.4%) are involved in EDP, and has an EDP budget of \$3.9 million, which represents 1.3% of the company's annual revenues.
 - The largest firm is \$1.8 billion in size and employs nearly 900 EDP employees, about 15% of the company's total of 5,900. This company's EDP budget is \$30 million or about 1.7% of the annual revenue.
- The insurance industry's ratio of EDP expenditures per total company employees is the highest for any sector analyzed in this report.

EXHIBIT IV-102

RESPONDENT PROFILE -
INSURANCE SECTOR

PROFILE CHARACTERISTIC	COMPANY SIZE IN TERMS OF ANNUAL SALES/REVENUES		
	LESS THAN \$100 MILLION	\$100-999 MILLION	MORE THAN \$1000 MILLION
PERCENT OF RESPONDENTS	45%	53%	2%
AVERAGE ANNUAL SALES	\$38M	\$304M	\$1,800M
AVERAGE TOTAL EMPLOYEES	308	1,639	5,933
AVERAGE EDP EMPLOYEES	28	121	895
EDP EMPLOYEES PER 100 TOTAL EMPLOYEES	9.1	7.4	15.1
AVERAGE EDP BUDGET	\$0.7M	\$3.9M	\$30.0M
EDP BUDGET % OF ANNUAL SALES	1.8%	1.3%	1.7%
EDP BUDGET PER EDP EMPLOYEE	\$25.0K	\$32.2K	\$33.5K
EDP BUDGET PER TOTAL EMPLOYEE	\$2.3K	\$2.4K	\$5.1K

- Exhibit IV-103 provides a measure of the range of values for the ratio of EDP budget to total company revenues reported by the insurance industry respondents. The mean value for the sector is 1.5% compared to 1.27% for respondents across all industries.

2. BUDGET AND EXPENDITURE ANALYSIS

- EDP expenditures in the insurance sector will increase an average of 12.5% in 1979 according to respondents, but will continue at a slightly lower rate of 11.6% through 1983. Exhibit IV-104 provides a distribution of planned budget growth for the 1978 to 1979 period.
- As a percentage of the total EDP budget, expenditures for small computers, terminals, and communications will rise steadily in 1979 and 1980. During the same period, expenditures for mainframe computers, personnel, and miscellaneous other (supplies, forms, etc.) are forecast to decrease as a percentage as indicated in Exhibit IV-105. Software expenditures will hold even.
 - Based on the expected 12.5 budget increase for 1979, the absolute dollar expenditure in every budget category will be higher.
- Exhibit IV-106 provides a measure of the continuing growth of computer services and software in the process manufacturing sector as foreseen by EDP managers. As shown, significant increases are expected in 1978 for remote batch services and applications software.
 - It should be noted that the decline or low increase in processing services expenditures represent significant differences from previous INPUT forecasts. It is INPUT's opinion that control of most outside services purchases is not usually vested in the central EDP department (the source of most data contained in this report).

EXHIBIT IV-103

DISTRIBUTION OF EDP BUDGET TO
COMPANY SALES RATIOS FOR RESPONDENTS IN THE
INSURANCE SECTOR

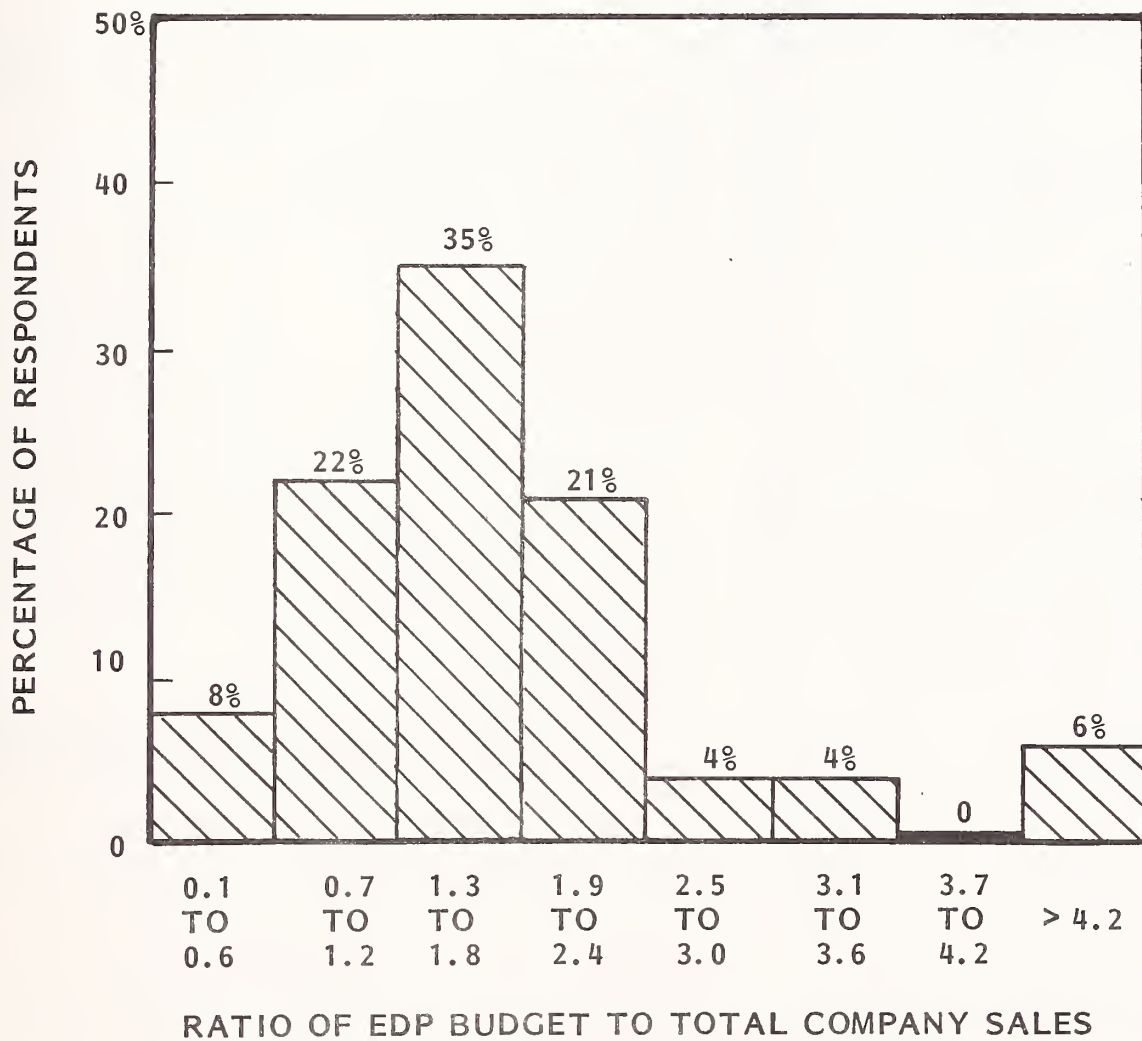


EXHIBIT IV-104

1978-1979 PLANNED EDP BUDGET GROWTH
FOR RESPONDENTS -
INSURANCE SECTOR

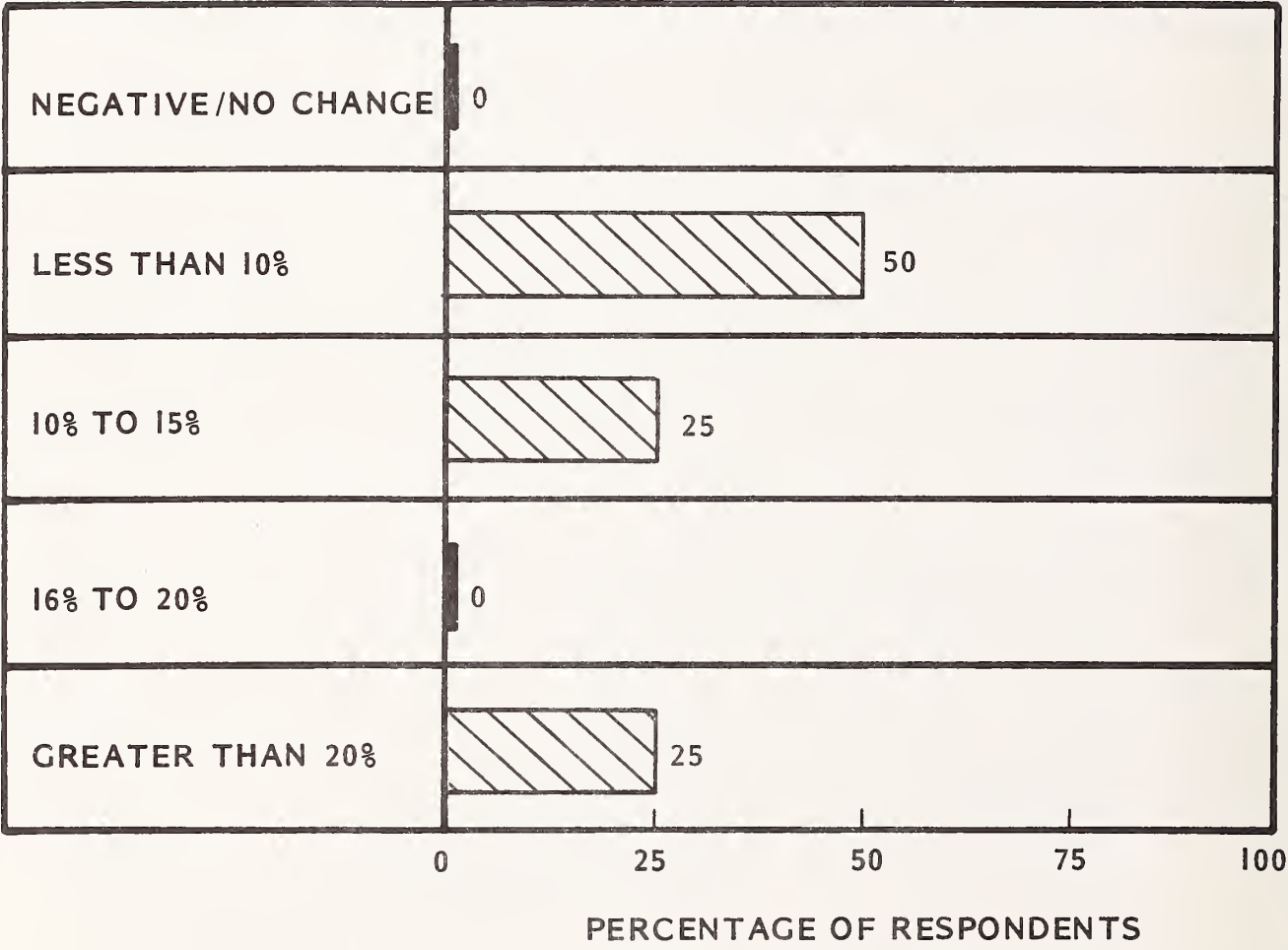


EXHIBIT IV-105

ANTICIPATED CHANGES IN EDP BUDGETS FOR RESPONDENTS IN THE
INSURANCE SECTOR

BUDGET CATEGORY	% OF TOTAL EDP BUDGET			INCREASE (DECR.) 1978 TO 1980
	1978	1979	1980	
MAIN COMPUTERS	26%	24%	21%	(19)%
SMALL COMPUTERS / PROGRAMMABLE TERMINALS	1	3	3	200
NON-PROGRAMMABLE TERMINALS	3	3	4	33
COMMUNICATIONS	2	3	4	100
SOFTWARE (PURCHASE /LEASE)	5	5	5	0
PERSONNEL	48	50	47	(2)
OTHER	13	11	9	(30)

EXHIBIT IV-106

AVERAGE EXPENDITURES FOR SERVICES AND SOFTWARE IN THE
INSURANCE SECTOR

TYPE OF SERVICE	1977 EXPENDI- TURES AVERAGE IN \$000	1978 EXPENDI- TURES AVERAGE IN \$000	PERCENT CHANGE 1977 VS. 1978
<u>PROCESSING SERVICES</u>			
INTERACTIVE	\$ 34	\$ 23	(32)%
REMOTE BATCH	113	312	176 %
BATCH	15	14	(7)
INPUT/OUTPUT	110	100	(9)
<u>SOFTWARE PRODUCTS</u>			
SYSTEMS SOFTWARE	\$ 32	\$ 40	25 %
APPLICS. SOFTWARE	57	81	42
<u>PROFESSIONAL SERVICES</u>			
CONTR. PROGRAMMING	\$127	\$147	16 %
EDP CONSULTING	22	19	(14)
EDUCATION	28	34	21
OTHER	-	-	-
<u>FACILITIES MANAGEMENT</u>	\$241	\$241	0 %
<u>MAINTENANCE</u>	\$ 95	\$117	23 %

- While there is movement toward bringing interactive computing services "in-house" which will reduce outside expenditure under EDP department control, there is still a significant increase in end user expenditure taking place as evidenced by other INPUT studies of the situation.
- Based on INPUT's annual forecast for the computer services industry, 1978 expenditures in the insurance sector are expected to increase 23% for remote computing services, 21% for software products, 21% for professional services, and 16% overall.

3. MAJOR PLANS AND PROBLEMS

- Study respondents who were visited or contacted by telephone for this study were asked to rank the importance of certain EDP/communications factors. As shown in Exhibit IV-107 the most important factors in the insurance sector were personnel availability and productivity.
- All respondents to this study were queried regarding major EDP objectives for 1978, 1979, and 1980. Exhibit IV-108 summarizes their responses and provides a ranking based on the number of mentions for major categories:
 - New application development and on-line application development remained at a high level through 1980, accounting for nearly 40% of all mentions.
 - The implementation of data base and distributed data processing systems more than triples as a combined percentage of mention in 1980.
 - The installation and upgrade of mainframes declines as an objective in 1980.

EXHIBIT IV-107

IMPORTANCE OF EDP/COMMUNICATION FACTORS RANKED BY RESPONDENTS IN THE INSURANCE SECTOR

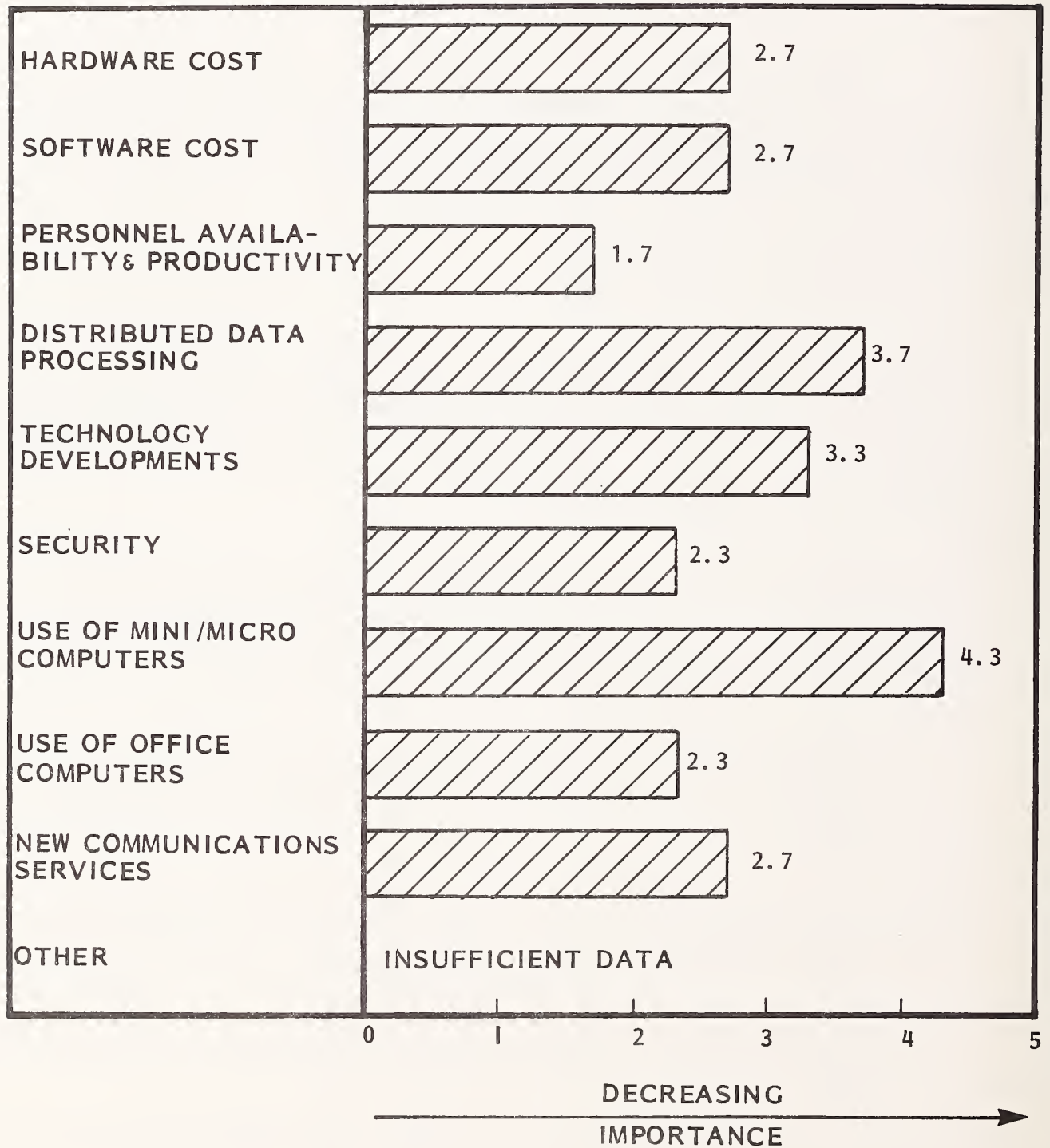


EXHIBIT IV-108

EDP OBJECTIVES FOR RESPONDENTS IN
THE INSURANCE SECTOR

OBJECTIVE	PERCENT OF MENTIONS		
	1978	1979	1980
DATA BASE DEVELOPMENT	5%	11%	13%
DESIGN/INSTALL DDP	3	12	17
NEW APPLICATIONS	18	18	17
ON-LINE APPLICATIONS	29	26	21
INSTALL/UPGRADE MAINFRAME	23	8	11
INSTALL MINIS	0	2	4
INSTALL OPERATING SYSTEM	5	6	4
IMPROVE OPERATIONS	9	5	4
CENTRALIZE (OR DECENTRALIZE)	2	2	0
OTHER*	<u>6</u> 100%	<u>10</u> 100%	<u>9</u> 100%
TOTAL MENTIONS	65	65	52

*SPECIFIC RESPONSES INCLUDE:

- Communications Network

- Exhibit IV-109 provides an indication of the applications being planned and developed by the insurance sector, together with an indication of which applications are considered to be of highest priority.
 - As in the case of banking and finance, industry specialized applications rank highest both in the number of mentions and the level of priority.
- Personnel availability and productivity are considered to be the most significant EDP problems in the insurance sector as shown in Exhibit IV-110.
- Contrary to other industry respondents, the sector uses more of its equipment and application programming personnel resources for maintaining existing programs than developing new ones (see Exhibit IV-111).
- Exhibit IV-112 provides a list and a ranking of the most popular methods being used in the insurance sector to reduce or improve the time and cost associated with the development of new applications.
 - The use of on-line programming techniques comprise more than 25% of all mentions.
- The expected increase in expenditures for communications and terminal devices through 1980 in the sector is clarified by analyzing the reasons for terminal installation for the same period. Exhibit IV-113 provides such an analysis:
 - Ninety percent of respondents indicate that source data input requirements were of high importance in terms of terminal installations for the next three years.
 - Approximately three-quarters of all respondents stated that data base inquiry was a high importance reason for installing terminals.

EXHIBIT IV-109

APPLICATIONS TO BE DEVELOPED BY RESPONDENTS IN THE
INSURANCE SECTOR

APPLICATION	PERCENT OF MENTIONS	% OF MENTIONS AS HIGHEST PRIORITY
ACCOUNTING/FINANCE	15%	11%
COST SYSTEMS	1	0
INVENTORY CONTROL	2	0
ORDER ENTRY/BILLING	2	3
PERSONNEL/PAYROLL	7	0
PURCHASING	0	0
MARKETING/SALES	5	3
MODELING/FORECASTING	1	0
COMMUNICATIONS	0	0
GRAPHICS	0	0
SCIENTIFIC/ENGINEERING	1	0
DATA BASE	8	0
ELECTRONIC MAIL	0	0
WORD PROCESSING	0	0
PERFORMANCE MEASUREMENT	0	0
OTHER* (INDUSTRY SPECIFIC)	58	83
TOTAL	100%	100%

*SPECIFIC APPLICATIONS INCLUDE:

- Special Insurance
- Underwriting Control
- Claims

EXHIBIT IV-110

MOST SIGNIFICANT EDP PROBLEMS BY RESPONDENTS IN THE INSURANCE SECTOR

ITEM	% OF MENTIONS
PERSONNEL AVAILABILITY AND PRODUCTION	23%
INADEQUATE SYSTEMS AND SOFTWARE	12
NEED FOR EDUCATION AND TRAINING PROGRAM	11
NEED FOR OPERATIONS IMPROVEMENT	11
INADEQUATE PLANNING	8
LACK OF USER INVOLVEMENT	8
NEED FOR IMPROVED STANDARDS, PROCEDURES, AND DOCUMENTATION	6
OTHER	21
<ul style="list-style-type: none"> - INADEQUATE DATA COMMUNICATIONS - NEED FOR PROJECT MANAGEMENT AND CONTROL SYSTEM - DIFFICULTY AND COST OF PROGRAM MAINTENANCE - LACK OF MANAGEMENT INVOLVEMENT - EXCESSIVE SYSTEM DEVELOPMENT TIME - LACK OF DBMS APPROACH - EXCESSIVE STATE AND FEDERAL REGULATION - INAPPROPRIATE ORGANIZATION 	

SOURCE: EDP USER PANEL

TOTAL MENTIONS = 99

EXHIBIT IV-111

USE OF RESOURCES- INSURANCE SECTOR

RESOURCE UTILIZATION CATEGORIES	RESPONDENT AVERAGE
<ul style="list-style-type: none"> ● COMPUTER EQUIPMENT : <ul style="list-style-type: none"> - PRODUCTION RUNS - NEW APPLICATION DEVELOPMENT - EXISTING PROGRAM MAINTENANCE - OTHER¹ 	73% 12 14 1 <hr/> 100%
<ul style="list-style-type: none"> ● APPLICATION PROGRAMMING PERSONNEL : <ul style="list-style-type: none"> - NEW PROGRAM DEVELOPMENT - EXISTING PROGRAM MAINTENANCE - OTHER² 	40% 58 2 <hr/> 100%

OTHER MENTIONS INCLUDE:

¹SYSTEMS UPDATE
EQUIPMENT MAINTENANCE

²SOFTWARE
TRAINING AND NON-PROGRAMMING
EDUCATION
SPECIAL REPORTS

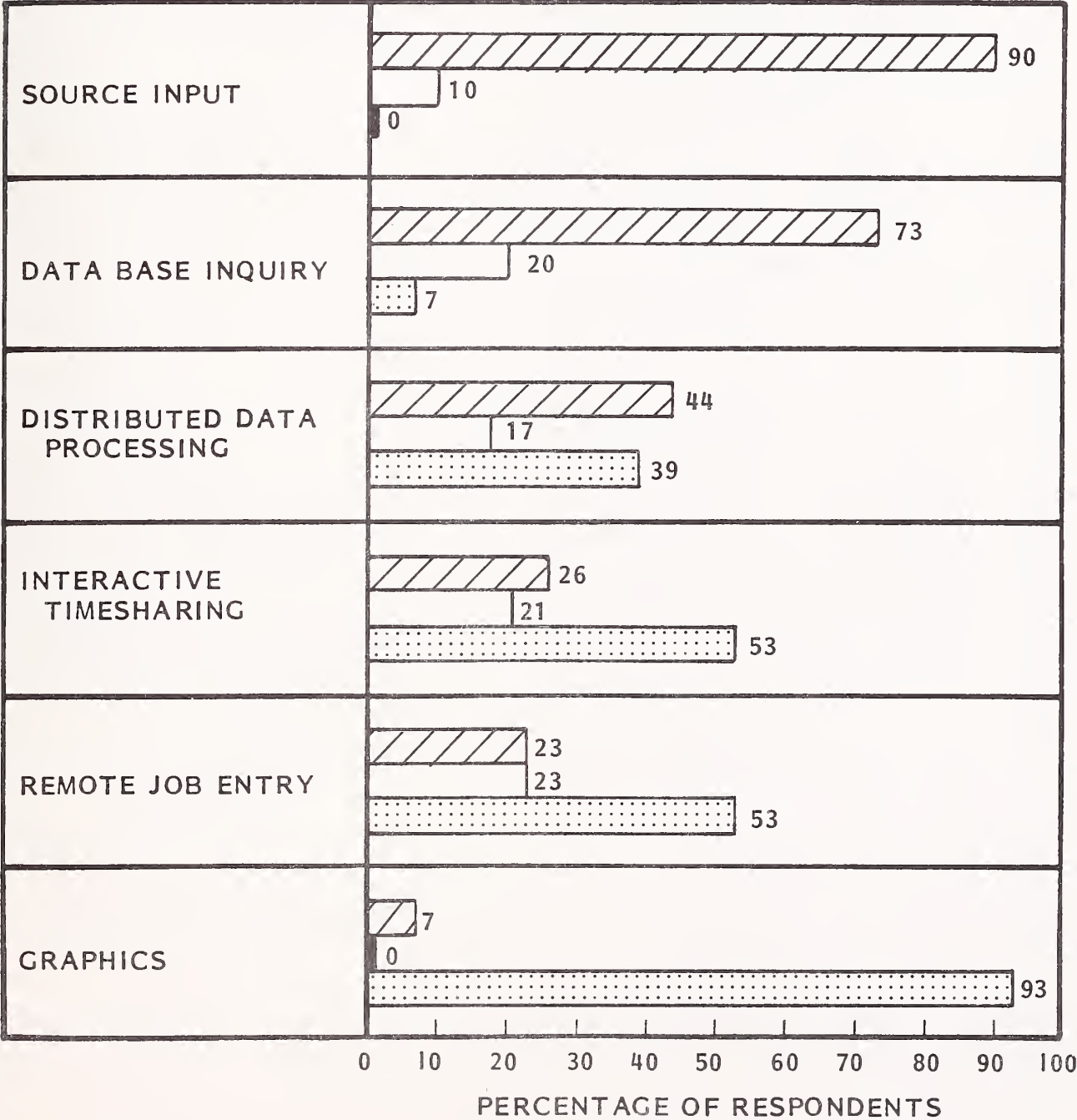
EXHIBIT IV-112




METHODS USED TO IMPROVE TIME AND COSTS ASSOCIATED WITH APPLICATIONS DEVELOPMENT- INSURANCE SECTOR

METHOD	% OF MENTIONS
ON-LINE PROGRAMMING	26%
STRUCTURED PROGRAMMING METHODS	12
PROJECT MANAGEMENT SYSTEMS	12
PERFORMANCE STANDARDS AND DOCUMENTATION	10
PROGRAMMER PRODUCTIVITY AIDS	8
PURCHASED SOFTWARE	6
HARDWARE UPGRADE	6
TRAINING	6
OTHER	14
<ul style="list-style-type: none"> - BETTER ORGANIZATION - DATA BASE MANAGEMENT - IMPROVED SYSTEM DESIGN METHODS - CHARGEBACK SYSTEM 	

EXHIBIT IV-113

RELATIVE IMPORTANCE OF REASONS FOR INSTALLING TERMINALS
DURING THE NEXT THREE YEARS -
INSURANCE SECTOR



-  = HIGH IMPORTANCE
-  = MEDIUM IMPORTANCE
-  = LOW IMPORTANCE

- Interactive timesharing and remote job entry have dropped to the point where more than one-half of the respondents rank these as low importance reasons for terminal installation.

4. KEY ISSUE STATUS REVIEW

- Data base management systems have been installed by 38% of the insurance respondents as shown in Exhibit IV-114. In those installations:
 - Fifty percent of the system was provided by IBM, 17% by other hardware vendors, and 33% by independent software suppliers.
 - The general level of satisfaction with the DBMS system is good with some dissatisfaction.
 - Most of the installations were made since 1976.
- Distributed data processing systems exist in 17% of the insurance industry respondent's firms. In addition, 10% of the respondents are presently implementing DDP systems, 50% are considering DDP systems, and only 23% indicate that DDP is not applicable (see Exhibit IV-115). DDP uses and intended applications for this industry sector as given by respondents include:
 - Claims processing and payment.
 - Data entry.
 - Order processing.
 - Remote processing.

EXHIBIT IV-II4

DATA BASE MANAGEMENT SYSTEM STATUS FOR RESPONDENTS IN THE INSURANCE SECTOR

FACTOR/CONSIDERATION IN PERCENT OF RESPONDENTS		
DBMS INSTALLED	CURRENTLY EVALUATING ALTERNATIVE DBMS	
YES 38%	YES 9%	NO 29%
NO 62%	YES 22%	NO 40%
<p>IF DBMS INSTALLED:</p> <p><u>DEVELOPER</u></p> <ul style="list-style-type: none"> ● IBM 50% ● OTHER HARDWARE 17 ● INDEPENDENT 33 <p><u>LEVEL OF SATISFACTION</u></p> <ul style="list-style-type: none"> ● SATISFIED 50% ● ACCEPTABLE 25 ● DISSATISFIED 17 ● UNKNOWN 8 <p><u>YEAR OF INSTALLATION</u></p> <ul style="list-style-type: none"> ● 1978 17% ● 1977 17 ● 1976 25 ● 1975 8 ● EARLIER 25 ● NO ANSWER 8 		

EXHIBIT IV-II5

RESPONDENT INVOLVEMENT IN DISTRIBUTED DATA PROCESSING- INSURANCE SECTOR

RESPONSE	PERCENT OF RESPONDENTS
DISTRIBUTED DATA PROCESSING ALREADY INSTALLED	17%
DISTRIBUTED DATA PROCESSING BEING IMPLEMENTED	10
DISTRIBUTED DATA PROCESSING UNDER CONSIDERATION	50
DISTRIBUTED DATA PROCESSING NOT APPLICABLE	23
TOTAL	100%

- Exhibit IV-116 summarizes the status of various office automation involvement areas by EDP departments in the insurance industry. Not surprisingly, the highest level of participation is in the data communications area with a reasonable level of participation in word processing and electronic mail expected by 1983. Consistent with other industry sectors, video conferencing is not expected to be the subject of much attention.

EXHIBIT IV-116

RESPONDENT INVOLVEMENT IN OFFICE AUTOMATION-
INSURANCE SECTOR

AREA OF INVOLVEMENT	PERCENT OF RESPONDENTS		
	CURRENT	BETWEEN 1978 AND 1983	NOT BY 1983
ELECTRONIC MAIL	8%	46%	46%
WORD PROCESSING	42	27	31
COPYING/DUPLICATING	23	12	65
DATA COMMUNICATIONS	63	30	7
VOICE COMMUNICATIONS	4	24	72
FACSIMILE	12	16	72
VIDEO CONFERENCING	-	4	96

I. SERVICE AND OTHER INDUSTRIES

I. SERVICE AND OTHER INDUSTRIES

I. INDUSTRY SECTOR OVERVIEW

- The information contained in this section is intended to summarize findings for companies not included in the previously defined eight industry sectors.
 - It should not be assumed that these findings typify any industry group within this category.
- Respondents included in this section are representatives from education, government, agriculture, mining, construction, real estate, auto repair, and entertainment.
- Seventy-two responses were provided by the education sector as part of INPUT's EDP user panel. No additional information was sought by telephone or on-site visits.
 - EDP managers from educational institutions provided a limited indication of their institutions' annual operating budget and, therefore, the EDP budget as a percentage of annual budget could not be computed accurately.
 - For the institutions responding, the average employed 1,889 people of which 46 (2.4%) were EDP employees. This ratio is lower than those of the financial and insurance sectors, but higher than those for other industrial sectors.
 - The average EDP budget was \$1.1 million. This translates to \$23,900 per EDP employee and about \$600 per total institution employee, which is consistent with other industry sectors.

- Five interviews were conducted with EDP managers from federal and state government. Although this is a small sample, the growth rates, the plans and objectives, the ranking of problems, and the use of resources appear to be consistent with responses from other industry sectors.
- An additional 16 respondents from other categories provided responses. These are used in the analysis which follows.
- Exhibit IV-117 provides a profile summary of these respondents for companies in three size categories:
 - About one-sixth (18%) of the companies reported annual sales of less than \$100 million averaging \$48 million. This average company employs 829 personnel of which 19 (2.3%) are EDP personnel, and has an annual EDP budget of \$500,000 (1.0% of annual sales) which translates to \$26,300 per EDP employee and about \$600 per total company employee.
 - Sixty-eight percent of the respondents ranged in size from \$100 million to \$1 billion in annual sales. The average company in this category is \$329 million, employs 3,800 people of which 57 (1.5%) are involved in EDP, and has an EDP budget of \$1.7 million which represents .5% of the company's annual sales.
 - The largest process manufacturing companies responding to INPUT's survey average \$2.4 billion in annual sales and employ an average of 466 EDP personnel, slightly more than 1% of the total 43,500 employees. These companies reported EDP budgets which average \$12.8 million or about .5% of their total company sales.
- Exhibit IV-118 provides a measure of the range of values for the ratio of EDP budget to total company sales reported by respondents. The mean value for the group is .6% compared to 1.27% for respondents across all industries.

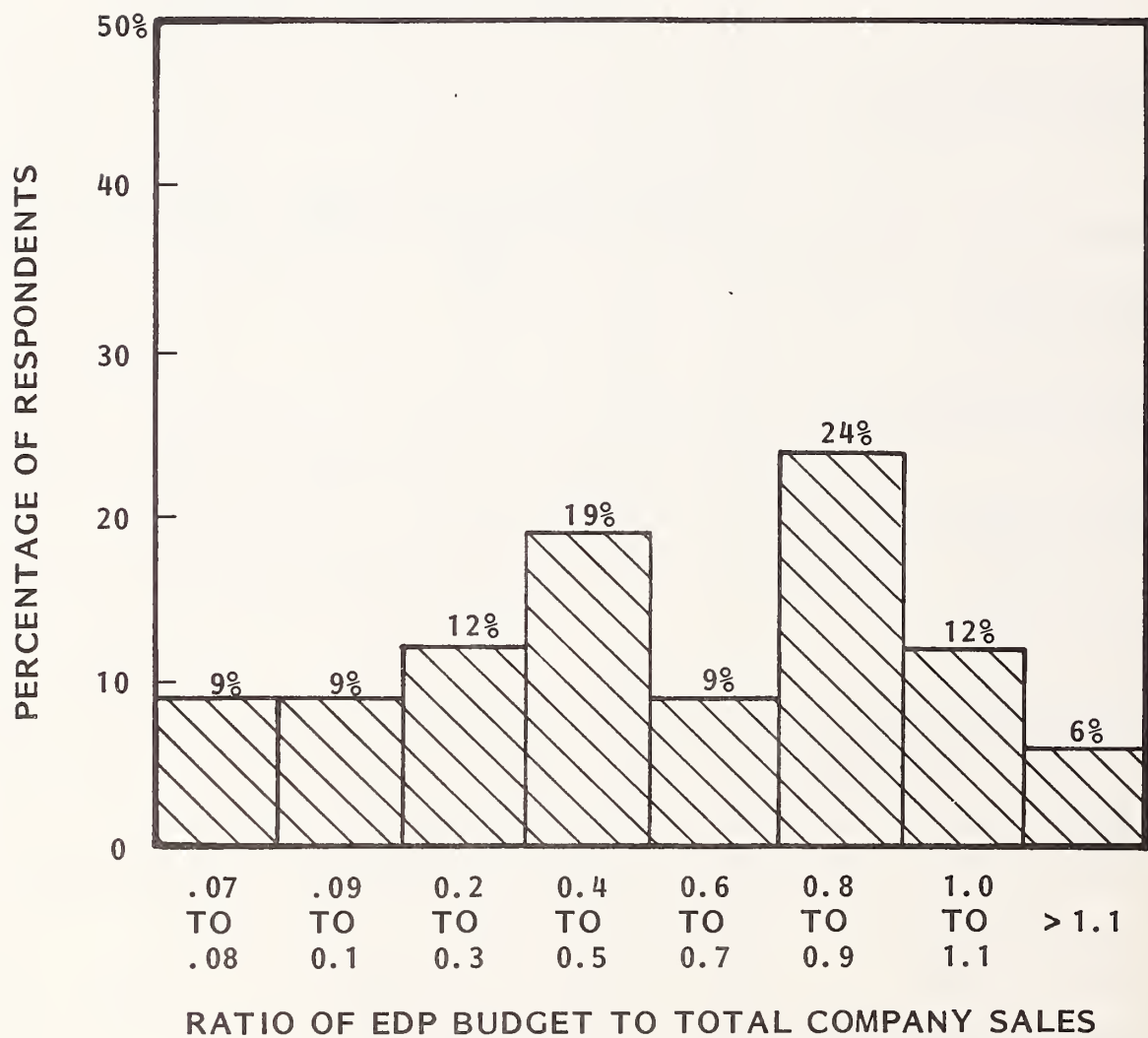
EXHIBIT IV-117

RESPONDENT PROFILE-SERVICE AND OTHER SECTORS

PROFILE CHARACTERISTIC	COMPANY SIZE IN TERMS OF ANNUAL SALES/REVENUES		
	LESS THAN \$100 MILLION	\$100-999 MILLION	MORE THAN \$1000 MILLION
PERCENT OF RESPONDENTS	18%	68%	14%
AVERAGE ANNUAL SALES	\$48M	\$329M	\$2,384M
AVERAGE TOTAL EMPLOYEES	829	3,809	43,500
AVERAGE EDP EMPLOYEES	19	57	466
EDP EMPLOYEES PER 100 TOTAL EMPLOYEES	2.3	1.5	1.1
AVERAGE EDP BUDGET	\$0.5M	\$1.7M	\$12.8M
EDP BUDGET % OF ANNUAL SALES	1.0%	0.5%	0.5%
EDP BUDGET PER EDP EMPLOYEE	\$26.3K	\$29.8K	\$27.5K
EDP BUDGET PER TOTAL EMPLOYEE	\$0.6K	\$0.4K	\$0.3K

EXHIBIT IV-118

DISTRIBUTION OF EDP BUDGET TO
COMPANY SALES RATIOS FOR RESPONDENTS IN THE
SERVICE AND OTHER SECTORS



2. BUDGET AND EXPENDITURE ANALYSIS

- EDP expenditures in the services and other sector will increase an average of 8% in 1979 according to respondents, but will continue at a higher rate of 10.5% through 1983. Exhibit IV-119 provides a distribution of planned budget growth for the 1978 to 1979 period.
- As a percentage of the total EDP budget, expenditures for small computers, terminals, communications, and software will rise in 1979 and 1980. During the same period, expenditures for mainframe computers, personnel, and miscellaneous other (supplies, forms, etc.) are forecast to decrease as a percentage as indicated in Exhibit IV-120.
- Exhibit IV-121 provides a measure of the continuing growth of computer services and software in the process manufacturing sector as foreseen by EDP managers.
 - It should be noted that the decline or low increase in processing services expenditures represent significant differences from previous INPUT forecasts. It is our opinion that control of most outside services purchases is not usually vested in the central EDP department (the source of most data contained in this report).
 - Based on INPUT's forecast for the services industry, this sector should experience an increase from 1977 to 1978 of 21% for remote computing, 14% for batch processing, 23% for software products, 10% for professional services, and 16% overall.

3. MAJOR PLANS AND PROBLEMS

- Study respondents who were visited or contacted by telephone for this study were asked to rank the importance of certain EDP/communications factors. As shown in Exhibit IV-122, the most important factors in this sector were personnel related.

EXHIBIT IV-II9

1978-1979 PLANNED EDP BUDGET GROWTH FOR RESPONDENTS- SERVICE AND OTHER SECTORS

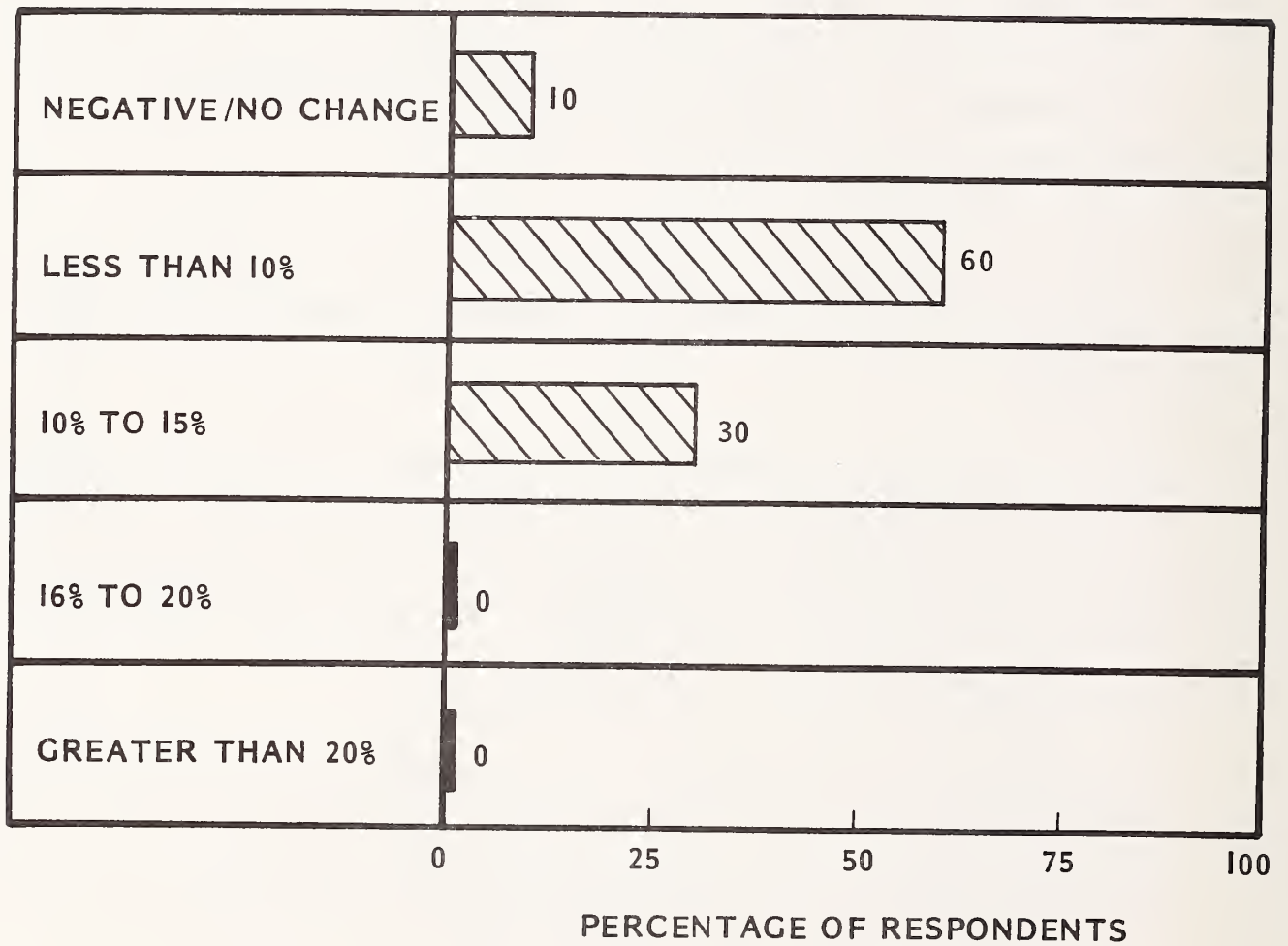


EXHIBIT IV-120

ANTICIPATED CHANGES IN EDP BUDGETS FOR RESPONDENTS IN THE SERVICE AND OTHER SECTORS

BUDGET CATEGORY	% OF TOTAL EDP BUDGET			INCREASE (DECR.) 1978 TO 1980
	1978	1979	1980	
MAIN COMPUTERS	28%	28%	25%	(11)%
SMALL COMPUTERS/ PROGRAMMABLE TERMINALS	6	13	16	167
NON-PROGRAMMABLE TERMINALS	4	3	6	50
COMMUNICATIONS	3	3	5	67
SOFTWARE (PURCHASE/LEASE)	3	6	6	100
PERSONNEL	50	46	42	(16)
OTHER	8	0	0	(100)

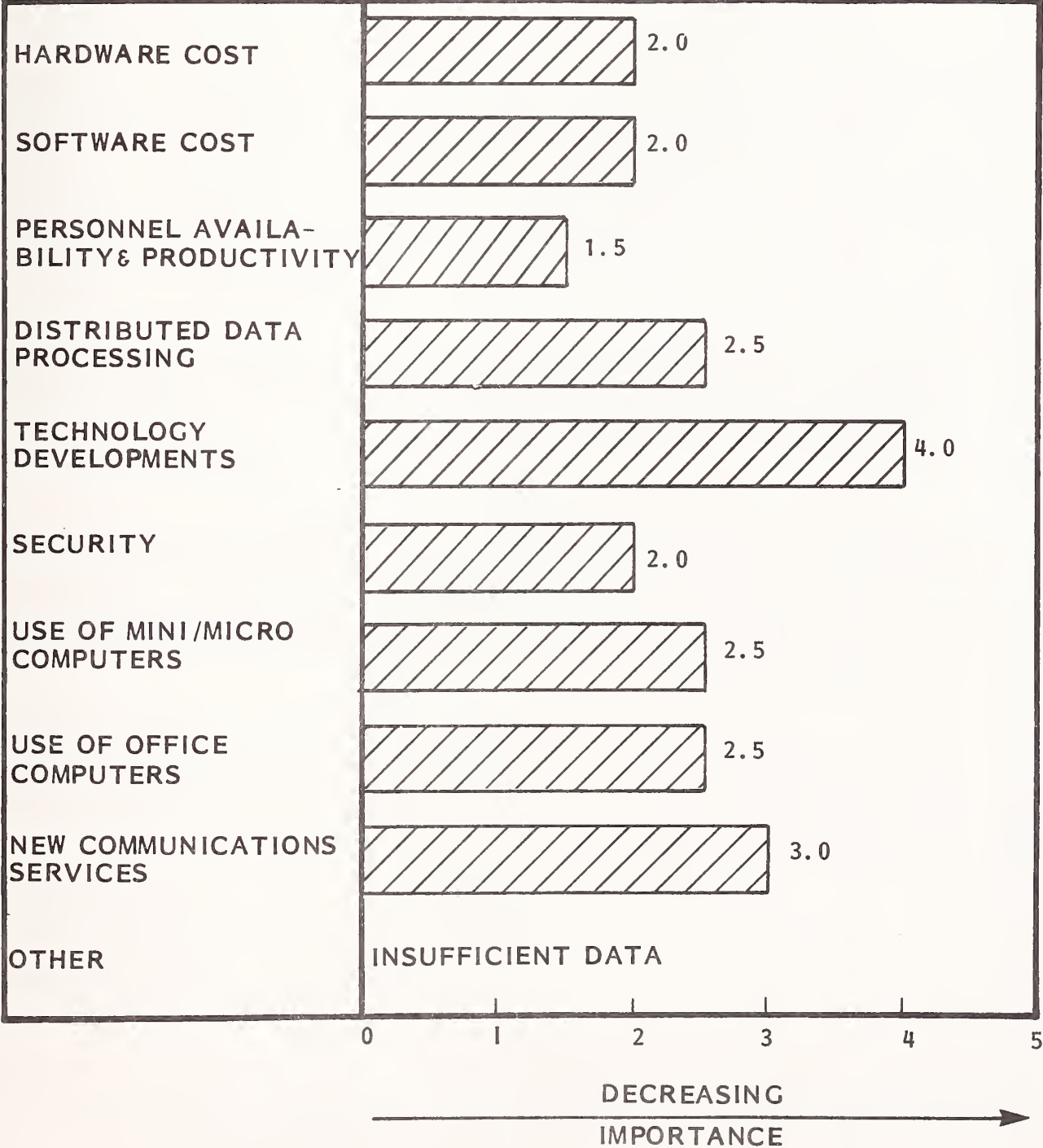
EXHIBIT IV-121

AVERAGE EXPENDITURES FOR SERVICES AND SOFTWARE IN THE SERVICE AND OTHER SECTORS

TYPE OF SERVICE	1977 EXPENDI- TURES AVERAGE IN \$000	1978 EXPENDI- TURES AVERAGE IN \$000	PERCENT CHANGE 1977 VS. 1978
<u>PROCESSING SERVICES</u>			
INTERACTIVE	\$ 28	\$ 30	7 %
REMOTE BATCH	50	50	0
BATCH	1000	1000	0
INPUT /OUTPUT	10	10	0
<u>SOFTWARE PRODUCTS</u>			
SYSTEMS SOFTWARE	\$ 45	\$ 52	16 %
APPLICS. SOFTWARE	35	45	29
<u>PROFESSIONAL SERVICES</u>			
CONTR. PROGRAMMING	\$ 60	\$ 60	0 %
EDP CONSULTING	9	47	422
EDUCATION	20	16	(20)
OTHER	-	-	-
<u>FACILITIES MANAGEMENT</u>	-	-	-
<u>MAINTENANCE</u>	\$ 75	\$ 109	45 %

EXHIBIT IV-122

IMPORTANCE OF EDP/COMMUNICATION FACTORS RANKED
BY RESPONDENTS IN THE SERVICE AND OTHER SECTORS



- All respondents to this study were queried regarding major EDP objectives for 1978, 1979, and 1980. Exhibit IV-123 summarizes their responses and provides a ranking based on the number of mentions for major categories, although the data is not believed to be sufficient to ensure reliable conclusions:
 - On-line application development remained at a high level through 1980.
 - The implementation of data base and distributed data processing systems accounts for 80% of combined percentage of mention in 1980.
 - The installation of mainframes and minis declines as an objective in 1980.
- Personnel availability and productivity and need for improved operations are considered to be the most significant EDP problems in this sector as shown in Exhibit IV-124.
- Consistent with other manufacturing industry respondents, the services and other sector uses about as much of its equipment and application programming personnel resources for maintaining existing programs as developing new ones (see Exhibit IV-125).
- Exhibit IV-126 provides a list and a ranking of the most popular methods being used in this sector to reduce or improve the time and cost associated with the development of new applications.
 - The purchase of outside software comprises about one-fourth of all mentions.

EXHIBIT IV-I23

EDP OBJECTIVES FOR RESPONDENTS IN THE SERVICE AND OTHER SECTORS

OBJECTIVE	PERCENT OF MENTIONS		
	1978	1979	1980
DATA BASE DEVELOPMENT	0%	17%	40%
DESIGN/INSTALL DDP	13	0	40
NEW APPLICATIONS	0	0	0
ON-LINE APPLICATIONS	25	50	20
INSTALL/UPGRADE MAINFRAME	13	0	0
INSTALL MINIS	13	17	0
INSTALL OPERATING SYSTEM	0	0	0
IMPROVE OPERATIONS	25	0	0
CENTRALIZE (OR DECENTRALIZE)	0	0	0
OTHER*	<u>11</u> 100%	<u>16</u> 100%	<u>0</u> 100%
TOTAL MENTIONS	8	6	5

*SPECIFIC RESPONSES INCLUDE:

- Communications Network
- Install Word Processor

EXHIBIT IV-124

MOST SIGNIFICANT EDP PROBLEMS BY RESPONDENTS IN THE SERVICE AND OTHER SECTORS

ITEM	% OF MENTIONS
NEED TO IMPROVE OPERATIONS	23%
PERSONNEL AVAILABILITY AND PRODUCTIVITY	20
LACK OF MANAGEMENT INVOLVEMENT AND UNDERSTANDING	13
INADEQUATE PLANNING METHODS	8
LACK OF USER INVOLVEMENT OR UNDERSTANDING	8
OTHER	28
<ul style="list-style-type: none"> - INADEQUATE COMMUNICATIONS CAPABILITY - NEED FOR ADDITIONAL TRAINING - INADEQUATE SYSTEMS AND SOFTWARE - NEED FOR REORGANIZATION - LACK OF STANDARDS AND DOCUMENTATION - NEED TO IMPROVE APPLICATION DEVELOPMENT TIME 	

SOURCE: EDP USER PANEL

TOTAL MENTIONS = 61

EXHIBIT IV-125

USE OF RESOURCES- SERVICE AND OTHER SECTORS

RESOURCE UTILIZATION CATEGORIES	RESPONDENT AVERAGE
<ul style="list-style-type: none"> ● COMPUTER EQUIPMENT : <ul style="list-style-type: none"> - PRODUCTION RUNS - NEW APPLICATION DEVELOPMENT - EXISTING PROGRAM MAINTENANCE - OTHER¹ 	65% 13 15 7 <hr/> 100%
<ul style="list-style-type: none"> ● APPLICATION PROGRAMMING PERSONNEL : <ul style="list-style-type: none"> - NEW PROGRAM DEVELOPMENT - EXISTING PROGRAM MAINTENANCE - OTHER² 	50% 46 4 <hr/> 100%

OTHER MENTIONS INCLUDE :

¹ OVERHEAD AND REVENUES
CONVERSION
CONTROL AND ANALYSIS OF
DATA CENTER
OUTSIDE SERVICES
IDLE
ENGINEERING

² CONVERSION
UTILITIES
TRAINING

EXHIBIT IV-126

METHODS USED TO IMPROVE TIME AND COSTS ASSOCIATED WITH APPLICATIONS DEVELOPMENT- SERVICE AND OTHER SECTORS

METHOD	% OF MENTIONS
PURCHASED SOFTWARE	24%
STRUCTURED METHODS	15
ON-LINE PROGRAMMING	12
INCREASED USER INVOLVEMENT	12
IMPROVED PLANNING	10
PROJECT MANAGEMENT SYSTEMS	7
OTHER	20
<ul style="list-style-type: none"> - EDUCATION AND TRAINING - IMPROVED TESTING METHODS - DOCUMENTATION - HARDWARE UPGRADE - PERFORMANCE EVALUATION 	

V VENDOR ANALYSIS

V VENDOR ANALYSIS

A. INTRODUCTION

- The year 1978 has been one of continued growth for the information processing industry. Basically, it has been a period in which users continued to integrate the computer more fully into the day-to-day operation of the business, with greater emphasis on the service rendered per dollar, and less on having the latest model for its own sake.
- This deliberate effort by the user to realize maximum productivity from the EDP department is most noticeable in the large mainframe arena, where product announcements have been relatively stable and marked by evolutionary change rather than dramatic, revolutionary technological pronouncements.
- A potential deviation from the stability of 1978 came in the fourth quarter when IBM announced its 8100 and System/38 lines. While both systems are in themselves small computers, their relationship to the larger series marks the beginning of an active campaign into distributed data processing and adds emphasis to IBM's System Network Architecture.

- The 8100 announcement was accompanied by IBM's introduction of a 64K RAM. This memory unit, and a 64K memory announcement by Texas Instruments are indicative of the exciting improvements users can expect in memory products on all classes of machines.
- Revenue growth for the major computer equipment companies from 1976 to 1977 ranged from 8% to 12%, and INPUT projects this rate of growth to continue depending largely on the economy in general.
- The minicomputer area was a particularly active one in 1978. Digital Equipment, Data General, Microdata, General Automation, Tandem Computer and other mini-vendors enjoyed high product acceptance and revenue growth.
 - This market area saw the mini-vendor moving away from the classic OEM market strategy to that of providing practical solutions for today's business problems.
 - More manufacturers offered COBOL and data base management tools for the user, along with improved peripherals, especially in the disk storage and printer area.
- The microprocessor also moved from the desk calculator and controller stage to that of a general purpose system as users learned to appreciate the potential of the micro to solve standalone business problems.
 - The micro's general-purposes capabilities were enhanced by improved mass storage and the appearance of higher level languages for developing business application programs.
- As the cost of mainframes drops, the role of peripherals becomes more significant:
 - The memory product offerings of various vendors (Memorex, Intel, EM&M, Intersil, Cambridge Memories, and others) for use with the

303X Series represent an economic alternative for holding down systems costs.

- Disk technology continues to advance, with increased capacities and faster access times as suppliers strive to outdo each other in meeting the demand for more on-line capacity.
- Improvements in disk technology seem directed more toward the non-removable storage devices on large systems, and increased capacities with dual-sided products in the floppies area.
- The software industry enjoyed greater acceptance as users turn more to packaged products, from both hardware vendors and independents, in still another attempt to hold down costs.
 - To date, systems packages enjoy greater acceptance and are more profitable due to two factors: replication of systems is far easier for systems packages than it is for applications packages; and, too, many systems packages are older and sold to a more universal market, putting them in a very profitable stage in their life cycle.
 - Applications packages are becoming available, with the Banking Industry appearing to have the lead in this regard; but payroll, accounts receivable, accounts payable, inventory control, and manufacturing systems are getting serious attention at the mini-level, with DEC and Data General hardware being the most commonly-used.
- The most significant event in 1978 on the communications front is the AT&T announcement for their "Advanced Communications Service" (ACS). This service, not expected until 1980 or 1981, offers an interesting alternative to the network services currently available. (ACS is discussed in INPUT's "Vendor Watch" series, an integral part of the User Service.)

- The Computer Services sector continues to enjoy exciting growth even with the threats posted by the "let's go in-house" philosophy and the availability of improved standalone mini-systems.
 - The service companies are responding to the minicomputer threat by upgrading their own product offerings and by developing distributed processing systems which provide for on-site hardware availability as a part of their service.
 - ADP, National CSS, Keydata, Itel and others have announced programs which include the marketing of on-site computers with their services.
- The professional services organizations are expected to enjoy continued prosperity as a result of the increased interest in packages and the growing demand for applications on mini- and micro-systems by small businesses who cannot afford in-house programming staffs.
- As expected, 1978 is another solid growth year for the Information Services Industry, and 1979 promises more of the same:
 - Technological advances continue unabated in the memory and mass storage area.
 - Microcomputers and the software to use them are making strides at two to three times the rate similar progress was made in the mini market area.
 - Minicomputers continue to grow at a rate which threatens all but the largest of today's computer systems.
 - All of the above imposes even greater demand for qualified personnel, adding to an already existing shortage which is expected to last for a decade.

B. HARDWARE VENDORS

I. MAINFRAME SUPPLIERS

a. Overview

- The year 1978 has been largely one of consolidation and gradual orderly expansion for mainframe manufacturers. Changes, if any, in this area have had a tendency to be evolutionary rather than revolutionary and have been dictated by marketing forces rather than technology.
- The IBM/Amdahl competition intensified as IBM commenced deliveries of the 303X series. Amdahl responded by lowering prices to match the competition, and by enhancing the 470 series with an "Assist" package.
- Amdahl further added to the high end competition by announcing the 470 V/8, its most powerful system to date. The V/8 is some 20% to 30% faster than Amdahl's previous top-of-the-line CPU, the 470 V/7, and is estimated to be approximately 1.5 times as powerful as an IBM 3033 single CPU. Deliveries of the 470 V/8 are scheduled to start in September 1979.
- Amdahl also chose this time period to announce an upgrade for the model 470 V/5 processor, the "470 V/5 II," estimated to be 10% faster than the earlier V/5 model. At this same time, Amdahl announced price cuts on its earlier models, which based on configuration, average to about a seven percent reduction.
- Burroughs Corporation continued to move within its own sphere of influence by introducing four new models of the B6800 series which are essentially mid-life kickers for an already successful product line.
- Control Data Corporation (CDC) is letting current demand lead its successful CYBER 170 series into greater utilization in the scientific/engineering area.

The CYBER's main markets continue to be in education, petroleum, electric utilities, weather, nuclear energy, and government defense.

- CDC appears content for the time being to develop the commercial marketplace by marketing the IBM plug-compatible Omega 480-2 processors, which are manufactured for CDC by IPL Systems.
 - CDC has moved, however, to increase its penetration of the peripherals and special systems area by announcing several new disk storage products and by assuming control of Computer Peripherals, Inc., which had been jointly held with NCR and International Computers, Ltd.
 - In another move, CDC has invested in Scan-Data, a manufacturer of optical character readers and point-of-sale systems. CDC's interest in OCR goes back to the days of the Rabinow acquisition.
- Honeywell appears to be moving slowly with the Series 60 high-end of the marketplace since its recall of the 66/85. Rather, increased emphasis seems to be placed on the Level 6 minicomputer area, where Honeywell has competed effectively for a number of years.
 - Sperry Univac continued to follow the policy set in October 1977 when it responded to the challenge of the IBM 303X improved price/performance by introducing three models of the 1100 Series in addition to two models of the byte-oriented 90 Series.
 - The success of the IBM 370 Series hardware prompted additional activity and competition in the form of plug-compatible vendors, all of whom are seeking to offer compatible CPU's with improved price/performance over that of the industry leaders. Included in this group are:
 - Intel Corporation - marketing the AS/4 and AS/5 processors manufactured by National Semiconductor since 1976, and the AS/6 Model 2 built by Hitachi of Japan since late 1978.

- Control Data Corporation - shipped its first plug-compatible OMEGA 480-2 to a Texas based customer in August of this year.
- Magnuson Systems Corporation - unveiled two models which it claims yield two-to-three times I38/I48 price performance, with deliveries to commence in 1978.
- Nanodata Corporation - a firm which specializes in micro coding, joined the fray by announcing a pair of systems in the 370/I38 and I48 performance range. The Nanodata systems are unique in that they can emulate several computer systems concurrently, including the IBM 370, the DEC PDP II and the Data General Nova Series.
- Still another firm recently announced its intention to provide plug-compatible mainframes. CITEL Corporation, an affiliate of Instrumentation Technology, introduced a pair of IBM compatible CPU's in the I38/I48 medium scale range to be marketed on an OEM basis.
 - CITEL also plans to offer manufacturing licenses to interested customers. The two new systems are the initial members of an IBM compatible family called the "30XX" line, which is planned to span the IBM 370/303X series of mainframes.
- Not to be overlooked in the large systems marketplace is the CRAY-I System. This powerful system is already installed at the National Center for Atmospheric Research, Livermore Laboratory, and in Bracknell, England at the European Weather Forecast Centre.
 - Cray's first commercial order for its super computer came from United Computing Systems for installation at its national data center in Kansas City.
- Thus, the competition continues, undiminished, in the general purpose marketplace, with a heavy concentration of vendors striving to replace and/or

supplement the heavily entrenched IBM 360/370 series. All of this activity is taking place at a time when rumors abound of IBM's intent to announce a new series of products.

b. Significant Announcements

- Some of the most significant announcements to take place in the mainframe sector of the marketplace in 1978 are as follows:
- Burroughs, in the third quarter, set initial shipment schedules on two large computer systems that have been delayed, but backed off making a firm commitment on delivery of its first commercial super computer.
 - Delivery of the B7800, originally scheduled in the first quarter of this year, will be made in October. Burroughs Attached Fortran Processor (AFP), targeted initially for the current quarter, will be shipped beginning in March 1979.
- Cray Research received confirmation of Livermore Laboratory's intent to lease a second 1-megaword Cray-1 computer system.
- Honeywell offered its Xerox user base a new growth path into the Honeywell mainstream, introducing two Level 66/DPS systems designed to run the CP-6 operating system:
 - The Level 66 DPS/C3 and C5 are designed to handle 120 and 200 concurrent on-line users, respectively, and are aimed at current users of Xerox Sigma 9 and large Sigma 6 and 7 machines.
 - Additional models designed for users of large Sigma 9s, smaller Sigma 6, 7, and Model 560 equipment, are planned for future introduction, according to Honeywell.

- The new machines are seen as the first migration path into Honeywell's main line of computers offered to Xerox users, some 700 of whom are thought to have signed up with Honeywell for maintenance of their systems.
- IBM has lashed together two of its most powerful mainframes into a multiprocessor (MP) configuration that can provide up to 16 million characters of storage.
 - The 3033 MP provides 1.6 to 1.8 times the instruction rate of a single 3033 processor when running similar programs under OS/VS2 MVS. Users who want the MP version will actually be paying more than the cost of having two free-standing 3033 systems.
 - The MP configuration is available with a combined total of 8 to 16 million characters of storage. Each CPU memory can be accessed by both processors. A switching function permits program control of channel communications within the MP configuration.
 - Two groups of six channels are standard on each CPU and an optional group of four channels per CPU is available for a total of 32 channels for a full MP configuration.
- IBM also announced the "attached processor" (AP) version of the 3031. It is interesting to note that in this case, unlike the 3033, the AP version precedes any MP version.
 - The 3031 AP claims a performance ratio of 1.6 to 1.8 times the 3031 at approximately 1.3 times the prices.
 - Announcement of the AP version at such an early stage in the model life suggests a desire on IBM's part to hold the user and alleviate delivery problems on the larger systems.

- IBM was awarded a directed verdict in the Memorex Corporation vs. IBM trial in what has been termed an "unusual" decision by the presiding judge.
 - This decision may act as a signal to other firms bringing litigation against IBM of the futility of such action under the Sherman Antitrust Act.
- In May of this year, IBM gave indication of the magnitude of its backlog when it said the company would increase production of computer systems by 60% this year. It announced that the company's manufacturing facilities are operating on three shifts and are hiring an additional 10,000 people through 1978.
- In August of this year, IBM reorganized its 370/303X mainframe systems manufacturing division, splitting it into two divisions. The move is viewed as a "piece" of the awaited long-term reorganization of IBM aimed at greater decentralization and autonomy:
 - The reorganization split the Systems Products Division (SPD) into two separate divisions.
 - One retains the same name but will have development and manufacturing responsibility for "intermediate performance range products."
 - The other division is called the Data System Division (DSD) and will be responsible for development and manufacturing for "large, complex systems with primary emphasis on high performance products."
- 1978 has seen continued IBM activity in the government market. IBM converted to purchase three leased 370 computers in the government for sales totaling more than \$3 million. Third-party leasing firms, Amdahl and Itel, reportedly could not beat the IBM price.

- The Air Force converted to purchase a 370/168 for \$1.6 million that is currently being replaced at the Strategic Air Command by a new IBM 3033 computer.
 - The U.S. Senate also converted two 370/155 computers for more than \$1.5 million, when IBM rivals could not provide better conversion terms.
 - IBM offers extra bonus conversion credits to the government on its General Services Administration data processing schedule contract. After IBM 370 systems have been installed for a year or more, enough extra credits are built up making IBM's conversion-to-purchase price difficult to compete against.
- In October, IBM moved from rumor to reality concerning new products with the announcement of the new 8100 Information System:
 - The 8100 demonstrated IBM's acknowledgement of the distributed data processing philosophy.
 - The 8100 announcement incorporates some major technological advances in memory chips, as well as some interesting software facilities.
 - Incorporated in the new 8100 product line is a recognition of the user's demand for simplicity of use and improved program capability.
 - The unbundling of software in the 8100 is a harbinger of things to come. As suggested earlier by INPUT, IBM has felt the effects of plug-compatible competition and must do something to restrict the use of its system software. The 8100 pricing policy is a step in that direction.
- Intel expanded its Advanced Systems (AS) line of IBM compatible processors downward with an AS/3 in two versions that equal or exceed performance of IBM's 138 and 148 CPUs:

- The AS/3 models have a standard one megabyte main memory which can be expanded to twice IBM's limit on the 138 and 148.
- AS/3-3 is rated 1.4 to 1.8 times more powerful than IBM's 138, while the AS/3-4 is touted as being equal to or better than the 370/148.
- ITEL also extends the top of its AS line of IBM compatible mainframes by announcing the AS/6-2, which improves performance of the line by 10 to 25 percent, depending on which IBM operating system is used.
 - The AS/6-2, which is a product of ITEL's system development division, offers 1.2 to 1.5 times the performance of the IBM 302, while requiring no software modifications.
- The first commercial user of Intel Corporation's AS/5 mainframe claims to have an uptime record of 98.9% since it replaced an IBM 370/155 a little more than a year ago at Pacific Mutual Life Insurance Company.
 - In addition, the AS/5 has outperformed the 370/155 on throughput. Even though the 370/155 had an accelerator attached, the AS/5 processes the same workload in 25% fewer CPU hours than its predecessor.
- Magnuson Systems formally entered the IBM compatible CPU market in May, with models yielding two-to-three times 370/138/148 price performance:
 - The firm plans other models across IBM's 370/303X line and will market the machines directly to end users and to OEMs, with emphasis on the former.
 - Magnuson introduced two models, the M80/3 and M80/4, and promised an M80/5 later this year as a replacement for IBM's 3031.

- NCR has introduced the N-8370, its most powerful member of the N-8300 medium-scale family to date, which can accommodate up to nine programs at the same time:
 - The system provides a growth path between the N-8350, introduced last year, and the N-8450, which has 25% more power than the N-8370, the firm said.
- Designated the Two Pi/V32, a minicomputer intended for commercial data processing applications and "well suited" to distributed data processing, operates in the same performance class as the IBM 370/138. Designed by Two Pi Co., Inc., a subsidiary of U.S. Philips Corporation, the Two Pi/V32 can operate from the existing base of IBM 370 software.
 - The system operates in a "full virtual mode" and allows up to four megabytes of main memory.
 - Currently, the Two Pi/V32 uses standard IBM peripherals, but the company plans to introduce controllers to permit use of competitive minicomputer peripherals. At that point, the entire system will have an expected 2:1 price advantage over IBM.
- National CSS announced plans to market a 32 bit, IBM 370 compatible mainframe which is offered for either standalone use or as an extension of its traditional timesharing services:
 - The first announcement mentioned a system designed and built for NCSS by Two Pi Co., Inc. (see above).
 - The NCSS 3200 Series machines are being marketed only with NCSS' VP/CSS Operating System. Five models, featuring a virtual machine environment with up to 16 megabytes of virtual memory, are able to handle timesharing, batch, and RJE applications simultaneously.

- In May, Sperry Univac introduced its 90/80-4 computer, a new top of its 90 Series said to outperform IBM's 3031 by 16 to 20 percent.
 - Essential differences between the 90/80-4 and the earlier 90/80s lie in the use of a cache buffer and in the way memory is organized.
 - Univac is aiming the 90/80-4 at two markets: an upgrade for its own customer base, including users on the old RCA made, Univac owned Series 70, and an intercept model for IBM users, those still using the 360/65 as well as 370 models.
- Hitachi unveiled a new large-scale computer system in September announcing it as 70 percent faster than IBM's 3033 with a memory capacity twice as large. Designated the M-200H, the computer also was described as being 10 times faster than the M-200 introduced earlier this year by Fujitsu.
 - Hitachi said it would consider overseas inquiries to supply the large-scale system to original equipment manufacturers. A revised model of the M-200H is thought to be in the process of being prepared for Intel to market as the AS/7.

2. MINICOMPUTER SUPPLIERS

a. Overview

- In no sector of the computer hardware industry today does product definition become more difficult than in the area traditionally called "Minicomputers."
 - Originally, this area encompassed products sold on a purchase only basis, and included mainframes with a word size of 8, 12, or 16 bits and a maximum of 65K of address space.
 - Software was generally limited to a primitive operating system and an assembly language.

- The product was sold primarily to an Original Equipment Manufacturer (OEM) and generally found its way into a single freestanding application, such as automatic testing and process control applications.
- The current world of the highly successful "Minicomputer" manufacturer extends down into the micro world with single board sets (such as the LSI-11) and up to the mainframe vendor, with the power and versatility of the so-called "Super Minis."
- Nevertheless, the "Mini" category continues to exist and includes some of the most highly successful vendors in the industry, including Digital Equipment Corporation (DEC), Data General (DG), Hewlett-Packard (HP), General Automation (GA), Computer Automation, and Interdata.
- Included in this group must also be Honeywell, which is attacking the market with renewed vigor with the Level 6 Series, and Sperry Univac which has taken over the Varian computer line.
- All of these suppliers are characterized by having a broader product line which offers increased sophistication in CPU and peripherals. More important is the quality and variety of their software product offerings.
- Virtually all manufacturers now offer COBOL in addition to FORTRAN and BASIC.
- 1978 saw increased attention to data base management systems, such as TOTAL on the PDP-11, Interdata, and Varian series, and IMAGE on the HP 3000 series.
- In an ambitious move to attract PL/I fans, DG announced a PL/I for its Eclipse Series, while DEC offers a PL/I subset.

- 1978 was marked by a strong attempt on the part of mini manufacturers to shed the OEM, process control image and deliver a product that can satisfy the small business user as well as the traditional customer.
 - To date, the mini vendor still prefers to provide systems software and leave the applications programming to the customer or the independent programming specialists.
- Still, with the price performance currently available on the minis, and with an increasing number of sources for applications packages, the mini manufacturer with his reliable, real-time system is penetrating an increasing number of commercial environments, particularly with the advent of distributed processing.
 - General Automation equipment is widely used by the Bank of America and Security Pacific, while Computer Automation has secured significant contracts from Insco and Fireman's Fund.
 - IBM's role cannot be ignored as the Series/1 nudges into the marketplace with improved software announcements and expanded capability.
- This sector of the industry has also seen a significant commitment by mini manufacturers in the communications network area.
 - General Automation's AUTONET packet switching network designed to compete with Digital's DECNET, and Computer Automation's SYFA, represent signs of the mini market's "growing up" to provide more serious and direct competition to the traditional mainframe vendors.

b. Significant Announcements

- Items of interest in the minicomputer sector in 1978 include the following:

- Basic Timesharing, Inc. changed its name and introduced a new commercial timesharing system, the BTI 5000, which replaces the older BTI 4000 product line. The installed base of 3000 and 4000 systems is nearly 700, according to BTI.
- Cincinnati Milacron, the nation's leading machine tool builder discontinued its operations.
- Computer Automation introduced the SYFA Network Architecture which will allow its SYFA multi-terminal small business systems to share data bases and communicate in a variety of protocols.
 - Computer Automation won a competition to supply SYFA network processing equipment to the Continental Insurance Companies.
 - The system will do local branch processing during office hours as well as handle interactive queries to the central files.
- Computer Automation has announced shipments early in 1979 on its new multi-terminal computer system, which comes in configurations with up to 2 megabytes of main memory.
 - Produced by its previously all-OEM Naked Mini Division for sale to multi-buy end users through a dedicated sales force, the system, called Protos, will take Computer Automation into competition against small computer firms at the upper end of the market for the first time.
 - Protos is a general purpose, terminal-oriented, virtual memory system initially intended for sophisticated customers in engineering, software development, timesharing, inquiry/response, and text editing applications.
- Data General introduced the Eclipse M/600, which has the capacity of a large conventional mainframe, while offering all of the advantages of a mini-

computer. Data General also offers the first Array Processor (AP/130) available on a minicomputer.

- In a move to lure PL/I users to its small computers, Data General announced a PL/I compiler to run on its Eclipse computer. Data General's PL/I, which most closely resembles IBM's level D PL/I for the 370 line, is designed for scientific, business, and educational applications where PL/I's structured programming facilities can be used.
- Data General added two mid-range Eclipse models to its line, one a scientific (S/250), and one a commercial system (C/350):
 - The C/350 is aimed at the top 1,000 industrial firms, banks and insurance companies, state and local governments, and systems houses serving those markets.
- Digital Equipment Corporation broadened its DEC System 20 line with a new top and bottom, moves that effectively made the DEC 10 family obsolete:
 - Labeled the "2060" and "2020", both machines use the TOPS 20 Virtual Operating System, and are also the first DEC mainframes to use semiconductor memory.
 - Among the software packages available for the new systems are ANS-I COBOL and FORTRAN compilers, two versions of APL, a PL/I subset called CPL, an interactive query language, and ALGOL. A basic compiler and a data base management package are also available.
- In August, DEC opened its first retail store in Manchester, NH, aimed at first time users:
 - It will sell small business systems, processing systems and supplies, provide customer training courses, and a word processing service bureau.

- The store is not aimed at the hobbyist. This decision represents a new phase in the company's marketing strategy.
- In September, Digital Equipment Corporation announced hardware and software enhancements for its VAX-11/780 32-bit computer, including a four-fold increase in maximum main memory to eight megabytes.
 - In addition, DEC introduced two direct memory access interfaces, a 75-inch/second tape drive and a systems implementation language for the machine, introduced last fall as a virtual address extension to its PDP-11 family.
 - DEC's new offerings are "of special significance" for data acquisition and control in laboratory experimentation and for interfacing various devices by end users and OEMs.
- In August, General Automation introduced its new microprocessor-based numerical control system.
 - The family of 11 controls provides a complete range of metalworking capabilities from simple positioning to complex multi-axis contouring.
- Using General Automation computers, Artronic Information Systems has introduced a series of small computer-based banking systems designed to help manage transactions with the various banking networks - CHIPS, SWIFT, and Bankwire.
- General Automation plans its first customer test site installations this fall on its AUTONET packet switching network.
 - A result of work done for Bank of America and other customers, GA's AUTONET combines up to 255 "individual network nodes," each able to access directly 32 other nodes.

- AUTONET is based on packet switching concepts with full duplex synchronous data link control (SDLC) line protocols for message formatting and error correction.
 - AUTONET capabilities include asynchronous program-to-program communication for distributed processing, remote control of any processor's operating system to total network management, downloading and remote initialization for unattended operation of any node.
 - AUTONET connects to IBM host mainframes through IBM 2780, 3780, and 3270 terminal emulation.
- Harris Computer Systems introduced its biggest multi-user product featuring main memory over 3 million bytes, virtual storage in excess of 12 million bytes, and a 6K byte cache:
 - The Series 500 systems use the VULCAN operating system for concurrent timesharing, multi-stream batch, remote job entry, and real-time processing.
 - FORTRAN IV, COBOL, RPGII, and SNOBOL4 language processors are furnished with the operating system, interactive text editing, and support libraries.
- Hewlett-Packard broadened its offerings in the 3000 line, introducing the Series I and Series II. Hewlett-Packard also added two high end minis to the 1000 Series - called the "F" Series, with Models 2111F and 2117F.
- Hewlett-Packard introduced a new version of its 3000 Series, as well as its first packaged small business system:
 - The 3000 Series machine, an upgrade for the Model 2 called the Model 3, quadruples Model 2 memory, limited to 512K bytes, to a maximum of two megabytes.

- The enhanced OS enables connection of up to 32 terminals, operating synchronously or asynchronously, to be connected through a single port.
- Honeywell extended its Level 6 small computer line at the high and low ends with two new machines, new peripherals and software.
 - The new Level 6 computers, Models 23 and 57, are aimed at diskette-based, communications and COBOL-oriented distributed processing applications, respectively.
 - The Level 6 model 57 system is said to offer twice the performance of the previous most powerful COBOL-oriented Level 6 machine, the Model 47. The new system, is designed to extend the firm's DSE networking scheme built around a hierarchy of small systems and Series 60 mainframes.
 - Like the Model 47, the 57 has two processors - one that executes the standard Level instruction set and a second that is COBOL-oriented.
- Honeywell offers a growth plan for large Xerox Sigma users. The HIS Level 66/Distributed Processing System (DPS) is based on HIS Level 66 technology and is aimed at the high end of the CP-I user base - the Sigma 9 and large Sigma 6 and 7 users.
- In February, the Interdata Division of Perkin Elmer's Data Systems Group entered the small commercial computer market with a pair of packaged systems built around its 32-bit small computer.
 - The Interdata 700 and 800 Business Systems are the first packaged commercial systems offered by the division.

- The computers run under the firm's OS/32 MT operating system and are supplied with several software packages: multi-terminal monitor, COBOL compiler with ISAM file management, transaction controller assembler, HASP station support and a variety of utilities.
- IBM introduced a wide-ranging series of enhancements for its Series/I small computer, including a 256K byte CPU, new mass storage devices, a COBOL compiler and a variety of distributed processing features:
 - In addition to the new hardware and software products, which are answering current users' needs as well as aiming the Series/I at new markets, IBM reduced main memory prices for the system.
 - Other Series/I products introduced include a channel adaptor to connect Series/Is directly to 370 mainframes, a software package designed to offload TSO functions from a host 370, a two channel switch designed to switch I/O devices between Series/I processors and a variety of software enhancements for the real time programming system (RPS).
 - IBM announced two mass storage devices, a diskette magazine unit and a hard disk system which can be configured to handle up to 258 megabytes of on-line storage.
- IBM's general system division announces the System/38, its most powerful system to date, designed to serve as a migration path for the older System/3 and System/34 processors. (Code named "Pacific," this unit's announcement was predicated earlier by INPUT.)
 - System/38 includes main storage built around the new 64K bit memory chip announced with the 8100.

- Available with System/38 is a new unbundled operating system called "Control Program Facility" (CPF) which integrates functions such as workstation support, data base management, security facilities, and communications support.
- As indicated in the 8100 announcement, unbundling of software at this level indicates IBM's determination to thwart plug-compatible competitors.
- A new version of RPG, RPG III with simplified workstation support for defining and manipulating screen formats, is also available.
- Microdata introduced a small business system called "Vantage" at the low end of its Reality line aimed at the first-time user market:
 - Vantage can be expanded to 64K bytes of main memory, up to 40 megabytes of disk storage and as many as 32 terminals.
 - The new system uses current Reality software including the operating system English data retrieval language, Data/Basic, Proc, Runoff (a word processing language), and RPGII.
- Early in 1978, Modular Computer Systems, introduced the first model in a new series of computers called the Classic family. The computer, a variable 16- or 32-bit machine designated the 7860, is the firm's first product introduction since June 1976:
 - The Classics are aimed at Modcomp's traditional markets: measurement and control, communication, scientific and information processing applications.
 - In July, Modular Computer Systems extended its Classic line at the high end unveiling a new unit, the Model 7870, that quadruples the memory capacity of the earlier Model 7860.

- Systems Engineering Laboratories, Inc., introduced eight packaged systems using its 32-bit small computer, broadening the range of its SEL 32 Series.
 - Seven of the new products are SEL 32 Series packaged systems. The eighth unit is a new bottom of the line 32-bit processor aimed at the OEM market.
- Sperry Univac has announced a firmware "accelerator" for the Vortex-2 operating system for its V77 series small computers. The new package, designed to run enhanced Vortex software, provides 20 to 40 percent increases in available CPU cycles on the V77-600 computer.

3. MICROCOMPUTER SUPPLIERS

a. Overview

- Just as the minicomputer manufacturers have pushed down into the arena of microcomputers, the microcomputer manufacturers are improving their products in an upward thrust into the areas previously assigned to the small computer systems and the minicomputer manufacturers.
- Intel, Motorola, Fairchild Camera & Instrument, Zilog, Texas Instruments, and National Semiconductor, all of whom have provided powerful reliable microprocessors on a single chip, and later complete microcomputer systems, are preparing for an era which will provide computational skills comparable to the most powerful of today's minis.
- Since the price of these microcomputer devices is extremely low, it is essential that the manufacturers develop a market base broad enough to permit the sale of computer units in large quantities.
 - To do this, they are beginning to attack the former mini marketplace while at the same time opening up new markets for small systems in areas not previously justified.

- However, to successfully penetrate such markets requires software. It is in this area that the microcomputer vendor is perhaps making his greatest strides:
 - Today, he is situated where the mini manufacturer was some three to five years ago, offering a primitive operating system, and a BASIC compiler which is most often used by the application programmer.
 - The gap is closing fast. Already, versions of a COBOL compiler, FORTRAN, and even data base management software have been announced.
 - It is in the area of the microcomputer that the PASCAL language has also begun to attract a large following and enhanced versions of this powerful, easy to use language will be seen in the next twelve months from the microcomputer manufacturers.
- With the attachment of more sophisticated mass storage devices to these new products, manufacturers will expand their applications programming staffs and marketing and support organizations for a frontal attack on the "old-guard" established suppliers of both business and scientific systems.

b. Significant Announcements

- Product announcements of significance in the microcomputer area in 1978 include the following:
- Intel is now formally offering its MCS-86 16 bit microprocessor family, including the 16 bit 8086 CPU and peripheral support components, development software and design development aids:

- Features of the system include extended addressing to 1 megabyte of system memory, 16 bit hardware multiply and divide, dynamic memory relocation, extended string handling instructions, re-entrant program code, position independent programs and instruction look ahead.
- Joining in the contention for 16 bit microcomputer applications will be Motorola Semiconductor's MC-68000, a single chip CPU that offers many of the features found only in mid- and upper-range minicomputers.
 - The MC-68000 is the third 16 bit micro to be unveiled recently. Intel's 8086 family is already available, while Zilog is gearing its Z8000 for fourth quarter introduction.
- Ohio Scientific announced its CHALLENGER III microcomputer system which contains three different central computer units in a single case and sells for very little more than a single central processor.
 - With this system, a user can own a variety of programs that were written to operate with any of the three different computer units.
 - Challenger III runs programs written for the 6800, 6502, 8080, and Z-80 type microprocessors.
- A telecommunications system which enables the MITS 88006 to be used as an intelligent terminal in two-way communications with a remote timesharing device over phone lines has been introduced by Physical Biological Sciences, Ltd.
- A COBOL compiler for the Intel 8080, 8085, and Zilog Z-80 microprocessors was introduced by Microsoft, a privately held software development firm that designed BASIC and FORTRAN software for the Altair computer systems now marketed by Pertec:

- COBOL 80 "conforms to the 1974 Ansi standard," thus giving users access to programs already written in COBOL. Relative and indexed file handling are included.
- Microsoft COBOL 80 allows a packed decimal data representation to conserve memory or floppy disk space.
- The rate of compilation is 250 lines per minute, according to Microsoft.
- Motorola has announced a COBOL compiler for its M6800-based Exorciser development system, aimed at OEMs developing business and professional applications.
 - The new compiler conforms to the entire level one 1974 Ansi standard COBOL, with additional higher level features to speed software development.
- The Z8000 microprocessor, to be sourced by AMD, places Zilog into the 16 bit market. Its computation power is reputed to be greater than that of the PDP 11/45 minicomputer. To insure its minicomputer status, Zilog will surround the device with a family of peripherals.

4. PERIPHERALS SUPPLIERS

a. Overview

- The peripherals area is becoming increasingly significant in the total electronic data processing systems as the price of mainframes drops and the numbers and sizes of ancillary devices increase.
 - It is in this area that the user may soon have greater latitude in vendor selections, since there tends to be a greater number of suppliers competing for the user's dollar.

- The plug-compatible manufacturer, while risking technological obsolescence at the hands of IBM, enjoys an identifiable market, with generally known product specifications, and a defined systems architecture that does not require him to educate the customer.
- As a result of the above circumstances, the astute user should consider his peripheral alternatives quite carefully, as the rewards, both economic and performance wise, can be significant.
- Areas of greatest interest with regard to peripherals during 1978 are: mass storage devices, plug-compatible memories, and printer products.
- In the disk market, the greatest growth is expected to take place for Winchester type fixed disks used with the larger systems.
 - This conclusion is supported by the number of vendors who have announced products. Control Data, Memorex, and Okidata have been joined by Shugart, BASF; other disk suppliers are expected to follow suit.
 - The competition developing in the Winchester area suggests a growing trend back in the direction of non-removable storage among systems planners.
 - At the low end, double sided floppies have been a disappointment to date, but manufacturers now seem to have the problems under control and strong growth in this sector is expected as suppliers rush to match the demand generated by the mini/micro small systems.
 - Due to start-up difficulties, and production problems, the single sided unit will still be the more prevalent in 1979, but the dual floppy should take over sometime in 1980.

- The success of the IBM 303X Series has generated a substantial demand for add-on bulk memory. Memory manufacturers including EM&M, National Semiconductor, Cambridge Memories, and Intel have announced products to satisfy this market.
 - The availability of multiple vendors is another economic benefit to the users.
 - In a rare move, IBM has announced the use of Intel as a second source to supplement its strained production facilities for random access memory devices.
- Pricing of main memory for small computers has also taken a drop, thereby contributing to lowering the cost of computing at this end of the marketplace.
 - Hewlett-Packard and DEC have both announced reduced price offerings as has IBM's General Systems Division for the new 64K board on the Series/I.
 - With increased use of new memory technology, particularly by the semiconductor houses, continued pressure for lower memory prices can be expected. This, in turn, should influence hardware vendors to build larger, more powerful processors to maintain price integrity for total systems, giving the user increased price/performance on his overall system.
- In the magnetic tape drive area, the 6,250 bits per inch (BPI) technology will continue to prevail and grow in availability.
 - Renewed interest in magnetic tape, particularly as an archival storage media, with the increased utilization of non-removable packs at the high end of the desk market can be expected.

- Storage Technology, Pertec, CDC, and Telex have already announced new 6250 BPI products in the small computer area.
- Another peripheral area of special significance in 1978 is printers. With computer costs falling, and the cost of supplies and people handling increasing, it is only natural that renewed attention be directed to the world of output.
 - The Xerox 1200, IBM 3800, and Honeywell Page Printing System are becoming more popular and additional competition in the high speed, non-impact segment of the market is probable.
 - At the other end of the output spectrum, the demand for hard copy at the terminal has also generated an increasing demand for improved performance and reliability in the low and medium speed line and character printers.
 - This market is estimated to be growing at a rate of 25% per year. In general, these devices come packaged in the sale of other units, but the user should carefully evaluate printer characteristics in his overall terminal system selection.

b. Significant Announcements

- Items of interest which have taken place in the peripherals sector of the industry in 1978 include the following:
- Computer Peripherals, Inc. (CPI), has begun operations as a consolidated subsidiary of Control Data as its owners completed plans to revise their holdings in the peripherals manufacturing venture.
 - With the change, Control Data has become 60 percent majority owner of CPI; NCR and International Computers Ltd., each hold 20 percent.

- Control Data introduced an IBM 3350 compatible Winchester technology disk storage unit with a capacity of 635 megabytes per spindle and 1,270 megabytes per cabinet:
 - Called the Model 33502, the unit doubles the capacity of the 3350 and increases by more than one-third the capacity of CDC's previous top of the line 400 megabyte 33801 enhanced Winchester drive.
- Control Data completed an agreement with Scan-Data Corporation under which it acquired long-term notes and preferred stock that will make it a one-third owner of the data entry firm.
- In June of this year, Intel disclosed that it has agreed to supply memory systems modules to IBM. The agreement covers the delivery of about \$25 million worth of systems over the next 15 months.
- Itel Corporation has introduced a non-impact laser printer, designed and manufactured by Siemens Corporation.
 - The Itel 7800 system incorporates a laser beam character generator that transfers characters electrophotographically onto standard single part forms. Data is handled line by line and printed page by page at a rate of 21,000 lines per minute or 8,800 forms per hour.
- IBM became more aggressive in the disk drive area by making substantial price cuts on its biggest disk files, the 3344 and 3350:
 - Price reductions of 20% on purchase and 10% on rental and lease were made on the 3344 and 3350, as well as the 3830 controller.
 - The move shows IBM's determination to protect and expand its market share.

- Memorex introduced a microprocessor controlled semiconductor cache memory designed to enhance access times on its IBM 3330 compatible disk drives:
 - Designated the 3770 DISK CACHE, the device stores frequently used data so that the data can be accessed at higher speeds than if it were on disk.
 - The scheme is claimed to improve overall performance, and being transparent to user programs, is compatible with existing access methods and operating systems.
- NCR Corporation agreed to acquire Quantor Corporation, maker of computer output microfiche (COM) systems.
- A solid state, plug-compatible replacement for IBM's 2305 fixed head disk drive was introduced here by Storage Technology Corporation.
 - The STC-4305 solid state disk uses charge coupled device (CCD) storage instead of rotating platters to provide better access times, higher data transfer rates, smaller physical space requirements and lower pricing than the equivalent IBM 2305 product.
 - STC's new product is totally plug-compatible with IBM's 2305, requiring no software modifications in user programming or in any releases of the OS, VSI, VM/370 or MVS operating systems.
- Telex Computer Products, Inc., introduced a 2,000 line a minute IBM plug-compatible line printer and an IBM 3350 compatible disk storage subsystem and controller.
- Xerox agreed to purchase the hard disk drive business from California Computer Products (CALCOMP).

- CALCOMP's floppy disk business was not included in the transaction since Xerox already owns Shugart Associates.
- the acquisitions will provide Xerox with a broad product line in both the rigid and floppy disk areas.

5. TERMINAL SUPPLIERS

a. Overview

- Originally, a terminal was a device that either accepted data via a keyboard for transmission to a processing unit or accepted data from a CPU for printed output, usually in a serial fashion.
- Today, however, the terminal unit ranges from the original primitive device to either "smart" terminals with limited storage and computational capability, or beyond that to a sophisticated, reasonably powerful, general purpose computer system.
- While the entire terminal market has enjoyed explosive growth since the advent of the CRT display, important advances have also taken place in the area of special applications devices, such as bank teller units, point of sale, credit, factory work entry, and brokerage products.
- All of these devices, in addition to the more powerful remote job entry units, make the terminal market one which requires special care and deliberation in the selection of application devices.
- The proliferation and improvement in display terminals deserve special attention in 1978. As these terminals have become more reliable and compact, increased utilization has taken place in all facets of data processing.
- They offer speed, convenience, and an "up-to-date" look in today's office.

- The demand for such units appears to be unlimited.
- Supporting the increase in terminal usage is the ability of both hardware and software to offer prompt accurate access to large data bases, permitting management to efficiently gain access to vital facts.
 - This trend is being magnified by the growth of distributed processing which is in no small measure made possible by the capability of today's terminal devices.
- IBM dominates the display terminal sector of the marketplace having some 50% of the display terminal units installed.
 - The most popular devices in the marketplace continue to be the teletype replacement, and the IBM 3270 and its predecessor, the 2260.
- A number of major independent vendors offer direct replacements for the 3270. Prominent vendors include Courier, Four-Phase Systems, Genesis One (MAI), Incoterm, Raytheon, Sanders (Harris), and Sycor.
 - In all cases, the independents tend to offer both lower cost and additional performance as a sales inducement.
 - In addition to the IBM 3270, Teletype's Model 40 Series must also be recognized as a significant factor, particularly since AT&T is now free to offer the product without qualification.
- A major factor in the entire terminal marketplace in the next five years will be the growing improvement in and use of microcomputers in terminal systems and devices:
 - These densely packed units, and the complementary improvements in storage technology and printing devices, will further enhance the role of the terminal.

- Terminals will become more truly general purpose elements in the distributed processing environment.
 - At the low end they will become multi-function workstations handling a variety of tasks, not the least of which will be communications oriented.
 - Finally, increased use of color and graphics in the display-type units can be expected.
- Due to the pressures of research and development, financing for an expanding lease base, cost of applications software, marketing and maintenance, it can also be assumed that the current proliferation of vendors will diminish as marginal suppliers drop out, and independents either merge or become acquired by more successful vendors.
 - Therefore, evaluate the stability of your terminal supplier carefully before making a major commitment.

b. Significant Announcements

- Notable events in the terminal sector of the industry in 1978 include:
- Data 100 introduced a multi-tasking attached processor that will add remote file management capability and more standalone processing ability to its Model 74, 76, 78, and 82 terminal systems.
- The Model 85 Attached Applications Processor plugs into existing terminal configurations to create a "Remote Information System," which consists of the processor, the terminal and peripherals.
- It can perform data entry, batch communications, IBM 3270 compatible on-line file inquiry, standalone processing using RPGII or COBOL and file management activities at remote sites.

- Datapoint has introduced an unbundled and enhanced version of the RPG compiler for its 5500 and 6600 series processors.
 - Designed to lure RPG users away from competitive systems, the new compiler offers enhanced compile and execution times, a move away verb, and more flexible input file descriptions.
- Incoterm Corporation became a wholly-owned subsidiary of Honeywell in 1978:
 - The subsidiary corporation will continue to be called Incoterm and will operate within the Information Systems part of Honeywell.
 - Incoterm has been a leader in the applications oriented intelligent terminal business with specific penetration in the airline, banking, and finance industries.
- Inforex, Inc., revised some configuration prices for System 5000 automated file handling equipment, which makes the equipment affordable for users with smaller budgets.
 - System 5000 includes a minicomputer-based control unit with an integral tape drive, up to 32 operator display stations featuring 1,920 character CRT display screens and typewriter-like keyboards, output printers, and disk storage units.
- Infoton signed a three year contract to supply Western Union Data Services Company with its I-400 CRT display terminals.
 - The I-400 is designed around the Zilog Z-80 microprocessor and will be applied for use in standalone and private wire networks.
 - In addition, Infoton will supply terminals for systems controlled by Western Union Data Services' Smarts Controller.

- IBM introduced programmable supermarket checkout terminals and controllers designed to be tailored to user's needs. The two new terminals can be used with three new program products or they can be programmed by the user.
- Mohawk Data Sciences with much improved vitality introduced the most powerful member of its Series 21 distributed data processing family of systems. Labeled the 21/50, the unit has two times the power of the previously announced 21/40.
- Northern Telecom, Ltd. completed its acquisition of Sycor, Inc., with the final value of the deal estimated at \$84.0 million. Sycor is expected to be operated as a subsidiary of the Canadian communications firm.
- Raytheon Data Systems unveiled two models of its PTS/1200 distributed processing systems which offer disk storage up to 320 megabytes and synchronous data link control (SDLC) communications protocol. Called the Mark I and Mark II, the new models are compatible with existing PTS/1200 systems.
- Sycor expanded its line of networked intelligent terminals with the debut of the entry-level Model 405 distributed data processing system.
- Teletype Corporation pushed deeper into the traditional data processing market when it unveiled the first of a planned family of user programmable terminal systems. Called the 4540, the initial product uses bisync communications and is compatible with IBM host communication packages and with Teletype's 40/4 terminal.
- Texas Instruments, Inc., introduced five Series 700 intelligent terminal configurations, a printer and a data base management system for its DS 990 commercial computer line.

- Sperry Univac closed the fifth year of its supermarket point of sale business by notifying its customers it was pulling out of the market because growth of scanner systems has not met earlier predictions.
 - In the past five years, Univac has installed a total of 70 checkout units, of which 12 have used a laser scanner for automatic reading of the Universal Product Code (UPC) symbol.
- Eastman Kodak Company entered the intelligent terminal market with what it believes heralds the next generation of image processing methods. Kodak's IMT-100 and IMT-150 microimage terminals are the first of a series that exhibit the increasingly compatible integration of microfilm and data processing systems.

C. SOFTWARE VENDORS

- The role of software continues to increase in importance in the world of electronic data processing. As the cost of hardware shrinks and as the cost of manpower increases, it is inevitable that programming and program products will receive increasing attention from both vendors and users.
 - Vendors will look to software as an important source of revenue and users will be devoting more attention to software in an effort to control costs.
- Some general observations that can be made relative to software in 1978 are as follows:
 - Data base management software is the area of greatest interest to systems planners at the present time, both in the large mainframe and minicomputer areas.

- With the increased attention to DBMS software and distributed data processing, data communications software and the need to find and train personnel proficient in applying its use are also of vital interest to corporate EDP planners.

I. SOFTWARE FROM HARDWARE VENDORS

a. Overview

- The importance of software as a sales aid and revenue producer is most obvious when one considers its role within IBM.
 - The IBM portfolio is so vast that if each package were licensed just once, the monthly revenue would amount to several hundred thousand dollars.
 - It is estimated that annual program product revenues at IBM have passed the half billion dollar mark.
- Based on the experience of IBM, it must be recognized that it is only a matter of time before all of the major manufacturers - Sperry Univac, Honeywell, Burroughs, NCR - adopt a similar strategy.
- In the minicomputer area, the manufacturers are all involved in ambitious software programs aimed at bringing their software portfolio up to the level of their bigger competitors. DEC, Data General, Interdata, SEL, and others are all committed to full-scale COBOL compilers.
- Personnel resources needed to meet the industry's demands for software are already in short supply and this condition is expected to continue into the mid-eighties.
 - As of 1974, according to Department of Labor statistics for 1977, the industry employed 97,000 systems analysts and 195,000 programmers.

- This figure is conservatively estimated to increase in 1985 by 65% for systems analysts or 160,000 personnel, and by 50% for programmers, or a total of 290,000.
- Pressures induced by the industry's need for qualified manpower suggest that no supplier can afford to make revolutionary changes in hardware that require extensive reprogramming, retraining, etc. Rather, systems which accommodate existing applications, while offering new, improved performance through re-organization of machine architecture and mechanisms for easier implementation and use are expected.
 - Conversion aids will continue to be required as users attempt to upgrade applications and undertake systems changes which cannot be avoided.
- The need for improved cost control in the software area is also responsible for increased use of software design methodologies such as structured design, the structured walk-through, the Jackson Methodology, Logical Construction of Programs, the META Stepwise Refinement, etc.
 - These techniques have in themselves spawned business opportunities for firms such as Yourdon, Softech, Software Consulting Services, and others who have specialized in this segment of the market.
 - These same pressures are certain to intensify interest in, and the demand for, software standards, particularly in high-order languages, data base management, and documentation.

b. Significant Announcements

- Some significant events which have taken place in 1978 with regard to hardware vendors and their software activities are as follows:

- A study completed by GUIDE, the IBM Business Users Group, reveals a general move toward MVS and VM/370 operating systems with a corresponding drop in the use of SVS, DOS/VS and non-VS operating systems in the next few years.
 - The study shows MVS growing from 330 users in early 1978 to some 607 users by the end of 1979. This move is prompted by the desire to take advantage of the VM/370-only features of IBM's 303X processors.
 - VM/370 is expected to grow in usage from an early 1978 installed base of 85 to 157 users by 1980.
 - The same study showed COBOL in use on a full-time basis at 819 guide member sites versus 116 for PL/I. The same experience was observed (355 for COBOL, 63 for PL/I) in the case of installations using COBOL on a casual basis.
 - Despite interest in, and pressure for, improved languages, the current base of users guarantees a continued emphasis on COBOL for the next three to five years.
- Amdahl introduced its "ASSIST" package to allow MVS/SE Operating System Selectable Unit (SU) to run on the Amdahl 470. This is the first program product for which Amdahl will charge. ASSIST simulates many of the IBM 370 extended hardware instructions.
- The Interdata division of Perkin-Elmer Corporation introduced a globally optimizing Fortran compiler for its 32 bit computer family which offers enhanced execution times and performance.
 - The Fortran 7 compiler, designed to be upward compatible, generates object code which runs in as little as half the time required for code generated by previous Interdata Fortrans.

- Intel Corporation moved a step closer to entering the computer mainframe business with an agreement to acquire MRI Systems Corporation, vendor of data base management software.
 - The acquisition provides the necessary software expertise for a specialized push into the end user computer business with Intel's relational associative processor (RAP).
 - INPUT regards this acquisition as particularly significant and believes that we can look for similar marriages of hardware/firmware and software technology in the data base area.
- IBM's General Systems Division introduced an installed user program which provides an operating system, programming language, data base manager and utilities for the Series/I small computer in distributed processing applications.
 - The Champion Distributed Processing System, developed by Tominy, Inc., for Champion International provides a COBOL-like language which is claimed to be machine independent.
 - The Champtalk language, as it is internally designated, is running on the Series/I and under OS and DOS on IBM 370 mainframes. IBM, however, has acquired non-exclusive marketing rights for only the Series/I portion of the Champtalk code.
- New releases of its virtual storage operating systems, OS/VS1 and OS/VS2 MVS, have been introduced by IBM's data processing division:
 - The newest release of MVS, designated 3.8, was termed a "refresh release" consisting of the previously available MVS 3.7 code plus 23 selectable units which have been integrated into the system as standard rather than optional routines.
 - In addition, five new selectable units were introduced.

- OS/VSI has been similarly treated, with the new Release 6.7 offering seven integrated selectable units and four new ones as optional.
- Data General formally announced COBOL for its super mini, the M/600. At the same time, the company also announced its Interactive Data Entry/Access (IDEA) applications development tool, INFOS file management system, and a sort/merge utility at the same time.
 - COBOL represents an implementation of the 1974 ANSI standard. An interactive debugging module is included to speed program development.
 - The INFOS file management system lets users create, maintain, and access data bases in multi-terminal, batch processing, and communications environments.
 - IDEA provides interactive data entry and inquiry/response.
- Honeywell added a data dictionary to its integrated Data Store/I data management system which enhances the use of data bases by programs.
 - The new package includes routines that analyze COBOL, Index Sequential Processing, and other source programs to determine what data elements a program uses and how it is used. Exception processing and privilege deletions via password protection are also included.
- IBM has agreed to provide software firms with pertinent information on system modifications and interfaces as soon as they become publicly available. The move, in effect, gives software firms the same status as IBM's hardware competitors who receive such information without having to search for it.
- Tandem Computers, Inc., introduced a Fortran Compiler fully conforming to the full ANS Fortran 77 specifications for use with its T-16 non-stop multiplexing systems.

- Systems Engineering Laboratories (SEL) has introduced the SEL COBOL Compiler program designed for program execution in the 32 bit multi-programming environment.
- New extensions to the 1100 Series Data Management System were announced by Sperry Univac. The Level 7 release includes: data base definition capabilities for ACCESS CONTROL (PRIVACY); validity checking; encryption and compaction facilities; and the ability to interface to user written data base procedures.
 - The DMS 1100 subscheme facilities are expanded to provide greater data independence and a greater degree of privacy.
 - A PL/I DML interface is also included which is functionally equivalent to that existing for FORTRAN and COBOL.
 - A new data base reorganization utility (DRU) facilitates efficient, non-procedural reorganization of the data base.

2. SOFTWARE FROM INDEPENDENT VENDORS

a. Overview

- The software products market continues to be one of the fastest growing segments of the entire EDP industry. INPUT forecasts a growth rate exceeding 22% in 1978, and anticipates this trend continuing, at least until 1982.
 - This market is aided by the "unbundling" policy of IBM and other manufacturers, who now make it easier for users to evaluate the economic merits of optional software.

- Contributing also to the growth is the scarcity of experienced programmers and the rising labor rate. Users find it more attractive to turn to a group of "specialists" for sophisticated systems:
 - The "not invented here" syndrome is vanishing as users strive for more efficient ways to use their existing manpower.
- A much higher level of sophistication now exists among the suppliers of software products. The products are imaginative, well written, adequately documented, and in general, marketed in a more professional manner.
 - One indication of the success of the independent software producer is the "Annual ICP Million Dollar Award" presented by International Computer Programs, Inc. Their 1977 awards saw two firms with sales of \$50,000,000 or greater for a single package - Informatics with MARK IV and Cincom Systems, Inc., with TOTAL.
 - In all, a total of twenty-one packages received \$20,000,000 Revenue Awards and ten received Million-In-One Awards, i.e., sales of more than one million dollars in the first year the product was on the market.
- Despite its impressive statistics, the software package market is a relatively young and volatile one. It is highly fragmented and made up of more than a thousand firms which have 25 or fewer employees and generate annual revenues of \$1.0 million or less. INPUT's Company Analysis and Monitoring Program for the Computer Service Industry (CAMP) tracks 2,400 firms in the services industry, many of which are software firms.
 - Products tend to specialize either by function (sorting, data dictionaries, data base management) or by industry, such as banking and insurance.
 - A major weakness among many software firms tends to be marketing and sales support capabilities.

- The improvements in minicomputers and microprocessors are creating a fresh, expanding market for software packages.
- Users find that independently produced software tends to be lower priced, superior in performance, incorporates more features, and is easier to install and use. (A more detailed description of this market can be found in INPUT's 1978 Computer Services Industry Annual Report, November, 1978.)

b. Significant Announcements

- Items of note in this area are as follows:
- Applied Data Research (ADR) has released Version 5.0 of LOOK, its real time performance measurement system for IBM/360 and IBM/370 installations.
 - The LOOK system is a flexible measurement tool that is capable of providing immediate and accurate appraisals of dynamic computer environments.
- Applied Data Research signed an agreement to purchase the software business of Insyte, a Texas-based developer of a data base management package and a telecommunications monitor.
- Applied Data Research announced an enhancement to its Librarian/VS source program management system with Archie, which provides retrieval of past versions of updated programs.
 - Changes made to a program are retained permanently by Archie which tracks the changes according to their date and the release number of the software assigned by the user.
 - The Librarian enhancement controls up to 255 levels or versions of a source program.

- CINCOM Systems introduced a version of its TOTAL data base package designed for use with the RSTS/E operating system on Digital Equipment's PDP-11 computers.
 - Designed for multi-task operation, the new TOTAL package is designed to interface with DEC languages such as MACRO II, COBOL V3, and FORTRAN.
- Informatics, Inc., has announced a new personnel system, the MANAGEMENT IV/Human Resource System. The system was designed to comply with and report on the various government regulations pertaining to employment practices.
 - MANAGEMENT IV encompasses all standard personnel functions, such as salary administration and attendance control, and provides for regular communications with employees.
 - It provides personnel managers with all relevant information regarding employees, groups of employees, overall company employment profiles, skills inventories, and government reports.
- The availability of a new feature for the MARK IV System has been announced by Informatics, Inc. Document IV is a complete, automatic MARK IV documentation system which provides an application overview using standard flowcharting symbols.
 - It also provides a data field cross reference list and branch statement cross reference list with no effort on the part of the programmer.
 - Document IV supplies a request flowchart which acts as a development/debugging tool to simplify the process of tracing the program flow.

- It also can act as an educational tool, helping to educate new programmers in the use of MARK IV through graphic aids.
- A lease management system for truck, car or equipment leasing companies has been announced by Promedics Data Corporation. The software package, consisting of a series of programs, is intended to assist the lease manager in planning his cash flow and increasing control over all lease operations.
 - The series of 12 programs can generate: customer lease quotes; alphabetical customer lists; ledgers; billing statements; cash posting journals; past due reports; termination credit reports; and a note payments due report.
- Value Computing, Inc., has announced the release of an on-line real time system tool for the VSI and MVS user. The Systems Management Tool (SMT) aids operations, systems programming, and production control personnel.
 - SMT provides a unique "early warning" system for operations that notifies the user of pending job time outs and allows the times to be reset.
 - For the systems programmer, it provides real time displays of control blocks, entry points and systems resurces such as CPU utilization, channel utilization, and device activity.
 - Production control personnel are able to access a real time system monitoring facility for fine tuning job schedules to ensure that the high priority jobs get the proper priority within the system.
- Tone Software Corporation has released an MVS version of its VS 1 time-sharing package. The new system, TONE 4 MVS, provides all the capabilities of standard IBM-TSO but with less overhead.

- A new on-line program development system, Message Management, is now available from Turnkey Systems, Inc. (TSI). Previously available only with TSI's TASK/MASTER package, Message Management is now available to CICS users.
 - The system reduces the time, effort and level of skill required to develop on-line applications by removing all display formatting and input data editing from the application program.
- Educational Data Systems has announced two new interactive data base management systems for NOVA-type computers. INFOTRIEVE and INFORMAT facilitate the maintenance and management of large or small NOVA-based data bases.
 - INFOTRIEVE, when used in conjunction with EDS's IRIS operating system, operates on a wide range of file types: formatted; contiguous; and indexed random.
 - A CRT-oriented query system, INFOTRIEVE includes all necessary subsystems for definition of files, creation/modification of records, and protection of fields for security purposes.
 - INFORMAT is a general purpose report writer which utilizes the selection facilities of INFOTRIEVE to permit reports of almost any format. All formats are designed interactively at the CRT.
- University Computing Company has announced the availability of the Burroughs 4.2 Release for its Commercial Financial Control System. The new release includes report writer, accounting and data processing enhancements.
 - Included in the accounting enhancements are improved accrual/reversal and standard journal entry features, improved fiscal year processing and simplified file maintenance procedures.

- UCC has also recently announced the availability of an on-line system to provide inquiry capabilities for users of the Financial Control System.
- Software International Corporation is offering a revised version of the Master Production Schedule module in its Net Change Manufacturing System to provide greater precision in developing and managing master production schedules.
 - The Net Change Manufacturing System includes seven modules, including basic inventory control, basic engineering materials and costs data, manufacturing and purchase order control, work in process inventory, material equipment and planning, material equipment and planning simulation, and master production schedule. A multiple inventory location module also is available.
- Haverly Systems, Inc. (HSI) has released level 3 of its Data Dictionary for the Univac 1100, DMS/1100 data base.
 - Containing additional features over the earlier release, it is designed to help data base administrators manage all data and programs in their shop whether DB or non-DB.
 - The HSI Data Dictionary stores all information in a data base (called meta base) using DMS/1100.
- Universal Software has announced the availability of Version 3.0 of its ADAS disk space management software package for IBM 360/370 DOS and DOS/VS installations.
 - ADAS is a transient driven system that automatically assigns disk space when a file is opened from available areas on a pack.

D. COMMUNICATIONS VENDORS

I. OVERVIEW

- Major users of communications networks today find themselves with a mixture of services and a blend of devices that exist, not by design, but by sheer necessity.
 - Terminal devices tend to be incompatible and are generally restricted to a single application, a fact which the EDP planner often finds extremely frustrating.
- Today, in the midst of the confusion that has traditionally surrounded data communications, signs that the problem might become less severe are evident. Pressure from practitioners of information processing, coupled with improving technology and imaginative competition, is beginning to force solutions. Data communications utilization is growing at a 20% rate and is playing a more prominent role in virtually every sector of the U.S. industry.
- In general, the three alternatives for the user of data communication networks are: to build your own; accept the package offered by IBM's System Network Architecture (SNA), (or equivalent from another vendor); or to use a Value Added Network (VAN) vendor, and trust that the choice has been a reasonable one that will survive over the period required to cover the system investment.
- Another alternative was provided in 1978 by AT&T's filing for "Advanced Communications Service" (ACS), a packet-type switched data communications service based on digital transmission facilities which AT&T already has in service as a part of its Dataphone Digital Service (DDS) and Dataphone Switched Digital Service (DSDS). Among the ACS features are:
 - Terminal and computer compatibility - permitting communications between terminals and computers, as well as terminal to terminal,

without the need for identical protocol. AT&T estimates that its plan supports over two-thirds of today's installed base of general purpose terminals.

- Call features and message addressing - to provide bi-directional transmission, such as inquiry/response, and for one way transmission, such as message switching.
 - Customer customization capabilities - such as message entry and validation, message store and broadcast distribution.
 - Network management - which is the mechanism whereby the customer can exercise control in conjunction with his customer network manager (CNM).
- AT&T's ACS System is directed not only toward the "FORTUNE 500" customers who presently account for approximately 75% of today's data communications, but also to the next several levels of data communication users (3,000-4,000 firms) who generate the remaining 25% of utilization.
 - While AT&T proposes to commence service in 1979, objections will most certainly delay that day, as EDP vendors and service firms who are potentially impacted by the ACS announcement file objections on the grounds that the service is "data processing" and not solely communications.
 - More than a dozen firms and trade associations have filed position questions with the FCC, including IBM, Telenet, Honeywell, and the Computer and Communications Industry Association (CCIA).
 - Regardless of the final disposition, the ACS move demonstrates AT&T's determination to compete for the EDP user's data communications dollar. ACS is certain to impact EDP vendors and other specialized communications service firms, such as the VANs, while ensuring the user of improved capabilities at lower cost.

- Today's communications trends will contribute to an increase in electronic mail. Planners should begin now to prepare for future systems opportunities that will be available by integrating voice/data/facsimile into their long-range planning activities.
- A unique sector of the communications function that deserves mention is the growth in electronic technology directed toward voice communications, particularly the private branch exchange (PBX) equipment.
 - Northern Telecom (Danray), TRW's VIDAR, Rolm, ITT's Northern Electric, Stromberg-Carlson, and GTE's Automatic Electric are all aggressively developing digital switching products and intensifying marketing in the area.
 - Others offering end user telecom systems, in addition to Bell, include RCA, Datapoint, and Collins.
 - These systems not only offer convenience items such as paging, background music, etc., but offer a potential for performing data processing functions.
- Users interested in improving the versatility and efficiency of the telephone service, while controlling abuses of the system are encouraged to investigate products which offer automatic call distribution, automatic least cost routing, and automatic identified outward dialing.
- The many communications innovations cited are placing increased pressure on the availability of systems analysts and programmers with the experience needed to service this market sector.
 - Users should pay special attention to the recruitment and training of personnel qualified to assist in the implementation of the communications based systems of the future.

2. SIGNIFICANT ANNOUNCEMENTS

- Items of interest in the communication sector of the market in 1978 include:
- Software vendors have introduced packages specifically designed to support the electronic preparation, switching and receipt of messages.
 - Computer Corporation of America introduced its Computer Message Transmission package (COMET) based on the PDP-11 minicomputer.
 - On-Line Software International introduced its Messenger system which runs on IBM 360 and 370 hardware under the Customer Information Control System (CICS).
 - Others who offer electronic mail services include Scientific Timesharing Corporation and Tymnet, Inc.
- RCA Service Company added the Plessey/Analog PBX to its line of telephone interconnect equipment, marking a build-up of RCA's nationwide sales activity in the business marketplace.
- ITT Corporate Communications, Inc. (CCI) began operations on a 16 city, switched voice communications service designed to provide corporations with private interstate networking.
 - The so-called switched private network service (SPNS) provides private line users shared access to long-distance, switched trunk facilities via dedicated lines between customer locations and seven ITT-CCI computer controlled switching centers.
- Pan American World Airways has ordered approximately \$11.6 million worth of Collins communications equipment from Rockwell International's commercial telecommunications group to build a private tie-line tandem network.

- The order includes four Collins automatic call distribution (ACD) systems, a PBX and a Model C900 network management center. The airline expects to save about \$1 million on its telephone bill in the first year of operation.
- Rolm's telecommunications division has developed two software packages which give new network capabilities to the firm's line of computerized PBXs.
 - The new capabilities allow users to install switching systems with automatic network dialing and a long-distance dialing ability resembling AT&T's Common Control Switching Arrangement (CCSA).
 - The CCSA-type feature will enable small- and medium-size companies to install private network switching systems which use the standard seven-digit numbering for interoffice calls and 10 digit numbering for off-network calls.
- Stromberg-Carlson introduced its first time division, pulse-code-modulation PBX.
 - The stored program-control PBX, designated the DBX 1200, is the third product in Stromberg-Carlson's System Century line of digital switching equipment using in-house designed telephony preprocessors and DEC LSI-11 small computers.
- BANKWIRE II - the latest version of the banking industry-owned domestic electronics funds transfer (EFT) system has been serving 186 subscribing commercial banks by handling 18,000 to 20,000 transactions per typical day.
- Iowa Transfer Systems, Inc., a bank-operated electronic funds transfer organization has chosen NCR computers for a central switch to handle statewide EFT terminals.

- Storage Technology Corporation announced its intention to enter the communications industry. Its first product, COM2, is a telephone voice multiplexor and private line concentrator, which permits simultaneous transmission of more than one voice conversation on a private telephone line.
- RCA began operations on a Bell System long-distance, direct-dial network that will connect approximately 120 company locations in the U.S.
 - The private switching service, which provides voice and data communications and allows customer premise network control, will make RCA the second largest corporate customer this year to use AT&T's Enhanced Private Switched Communications Service (EPSCS).
 - The network arrangement will use a combination of satellite and land-based access lines and trunks connected to AT&T switching centers.
- IBM and the Computer and Business Equipment Manufacturers Association (CBEMA) have protested to the FCC the sophisticated hotel management features AT&T is marketing as a software package for the Dimension 200 PBX.

E. OFFICE PRODUCTS/SMALL BUSINESS COMPUTER VENDORS

I. OVERVIEW

- The office products marketplace within the EDP industry, which encompasses calculators, small business systems, facsimile devices, data entry and word processing equipment, and copiers is currently one of the most volatile sectors of the information processing business. The rate of growth appears to be 13-15% annually.
- Factors which contribute to the dynamic nature of this market sector are:

- Improved performance and reliability of available products.
 - Increase in the number of vendors and product offerings.
 - Greater power and versatility in software languages and services routines, making installation easier.
 - Growing realization on the part of suppliers, both vendor and independents, that "canned solutions" represent a potential goldmine if properly identified and marketed.
 - Increasing demand for general purpose capability with data entry, retrieval and communications located close to the user as the distributed data processing philosophy expands.
 - Improved communications capability.
 - Growing interest in "the automated office" with electronic mail.
- While the market seems to have been identified and nurtured primarily by the data entry suppliers, such as Harris, Entrex, Mohawk Data Sciences, Four Phase, and others, it has also been quickly recognized by the major mainframe vendors, including IBM, Univac, Burroughs, and NCR, and further cultivated by the smaller terminal and CRT suppliers, such as Datapoint, Sycor, and Wang.
 - This segment of our EDP industry has not been overlooked by the mini-computer manufacturers, especially DEC, Data General, Prime, Microdata, and Hewlett-Packard.
- These, in turn, have been joined by system houses who have assembled complete solutions for the small businessman. Firms in this category include Randal, Data Systems, Basic IV, Cado Systems, GRI, Qantel, and Minicomputer Systems, Inc.

- The office products sector is not, however, without its problems, including:
 - Difficulty in defining packages sufficiently generalized to satisfy an economically viable market.
 - Problems in furnishing systems and maintenance support in remote locations.
 - Availability of sufficient personnel to design, implement, document, install and instruct users, and provide required maintenance.
 - Lack of resources to market the product. (INPUT's "Distribution Channels" report, provided as a part of the Small Establishment Service (SES) reviews this problem in detail.)
 - Lack of capitalization on the part of most suppliers in a leasing environment.
- Despite these problems, significant progress has been made in developing solutions which satisfy the small business user.
 - Higher level languages, starting with business versions of BASIC and continuing through FORTRAN and RPG to COBOL are being developed.
 - Applications packages are being written which offer meaningful solutions to the small businessman.

2. SIGNIFICANT ANNOUNCEMENTS

- Notable events which have taken place in this market in 1978 include:
- Sycor has announced the availability of the CDC Remote Job Entry (CDCRJE), a communications capability for its 445 distributed data entry and processing system.

- Sycor's 445 system users can tailor CDCRJE to fit the requirements of the CDC host computer and the available transmission capabilities by configuring the software for items such as line speed and number of buffers.
- Digital Equipment Corporation enhanced its line of word processing systems by introducing a new shared logic system, the WS 200 that can support up to eight work stations.
- A new desk top computer, said to be capable of memory expansion to 256K bytes and programmable in Assembly language as well as BASIC, has been introduced by Hewlett-Packard.
- IBM reduced prices for its Office System 6 line of standalone processing systems by 10 to 27 percent.
- At the same time, IBM introduced a new entry level unit, the 6/420, which has all of the capabilities of the earlier 6/430 except for magnetic card input capability.
- IBM has introduced a second COBOL for its Series/I small computer, introducing a package developed as an installed user program by Advanced Software Products, Inc.
- The new COBOL, introduced by Advanced Software in a less extensive form last year, provides upward compatibility with the Series/I Cobol introduced in June.
- Four-Phase Systems received an award for a \$5.5 million contract for word processing computer systems from the Social Security Administration, the largest single federal word processor contract ever granted.

- Fifty-four CPU's, 550 CRT terminals, and 375 character printers will be installed at Social Security headquarters in Baltimore and at six additional centers throughout the country.
- The systems will be used for letter writing, plus report and document preparation.
- ACS America, Inc. recently introduced the Primacs-I word processing system, which provides most of today's standalone word processing system features, including text insertion and deletion, pagination, upward and downward scrolling, paragraph and decimal tab setting, underscore, and right and left margin alignment.
- Digital Equipment Corporation introduced a line of DEC station computer systems aimed at both the OEM and end user markets.
 - Entry level for standalone use in small business environments.
 - Mid-level for both standalone applications and expanded systems that can be linked to the low end DEC station.
 - Upper level for large data base applications.
- Incoterm Corporation, a Honeywell subsidiary, has introduced a new software system designed for on-line interactive distributed processing.
 - Incoterm Transaction Entry Management System (ITEMS) software includes a high-level English-type language called Transaction Development Language (TDL).
 - Programmers can use TDL to develop data entry and editing applications specific to each installation and that can evolve as the applications grow.

- New software provides "maximum" use of local intelligence while maintaining central file data bases.
- Mohawk Data Sciences has added IBM 3270 and asynchronous protocols to its Series 21, giving the distributed processing systems their first interactive host communications capabilities.
 - The 3270 emulation software, which operates only on the System 21/40 and 21/50, is aimed at users of 3270-type terminals for current applications but who might benefit from combining the Series 21's local processing with host communications.
 - The asynchronous software, which is designed to run on all three Series 21 models, is aimed at similar applications.
- A source data entry software package that provides data conversion and editing capabilities for the Raytheon Data Systems PTS/I200 Mark-1 and Mark-2 distributed processing terminals has been introduced by Raytheon.
- Basic Four has set up a distributed data processing division.
- Lear Siegler's Data Products Division is setting up a distributed network for its recently introduced VDP-1000 small business system.
 - Lear Siegler is targeting the system for customers with annual sales of \$500,000 to \$10 million for accounts receivable, payroll, inventory, and other general business uses.
- Wang Laboratories has introduced a new 2000VS-B virtual memory computer which includes 64K memory, a single diskette drive and 10 megabytes on-line storage with a 120 character per second impact printer.
 - The new entry from Wang can be programmed in BASIC, COBOL, or RPG-11.

- Applications packages available for the system include a complete line of accounting system functions, such as payroll, general ledger, accounts receivable, and related work.
- Packages for some banking needs also will be available.
- The interactive version of its ANSI COBOL programming language has been released by Datapoint Corporation. Users can now employ COBOL for interactive tasks such as on-line data entry as well as for batch oriented assignments like report generation.

F. SERVICES VENDORS

I. OVERVIEW

- Despite the pressure of in-house systems and freestanding minicomputers, the services segment of the computer industry continues to grow and prosper. INPUT's "1978 Study of the Computer Services Industry," done under a commission granted by the Association of Data Processing Service Organizations (ADAPSO), forecasts a compound annual growth rate of 17% over the next five years for this industry sector.
- Computer services are marked by the "value added" contribution that vendors make to the hardware, software and communications products of the suppliers in order to bring cost effective solutions to the user.
- The 1977 market for computer services is estimated to have been \$7.0 billion, and with a projected 17% growth rate is forecast to increase to \$15.0 billion by 1983.

- With the computer equipment growth rate ranging from 8% to 12%, computer services are enjoying a faster growth rate than the equipment markets.
- The computer services sector is particularly sensitive to the growth in the mini/micro market, and the ability of small systems to provide solutions to business problems on a standalone and distributed data processing basis represent a challenge to services organizations.
 - The competition from the mini/micro sector is sufficient enough that services companies acknowledge that about 25% of their current business is vulnerable to replacement by minis.
 - This condition suggests that the larger service organizations can be expected to acquire the smaller, less healthy firms and there will be some fallout among the less stable, poorly managed organizations.
 - The survivors, however, will be stronger and grow more rapidly. The economic condition of a supplier should be carefully reviewed before contracting with the organization.
- In response to the small computer threat, service companies such as ADP, National CSS, United Computing, Keydata and others have announced programs under which they will provide on-site computers linked to their networks with a future potential for moving such systems "in-house."
 - Total solutions that the vendors are prepared to furnish and maintain on his computer, the client's computer, or both represent one answer to the mini threat.
- While this approach may represent a replacement market for certain services already available, it also offers a vehicle for creating new markets for the value added services of these vendors and, ironically, for the minicomputer hardware.

- The suppliers of software products and professional services view this explosion of product offerings as an additional business opportunity.
 - The need for new systems will generate a need for competent personnel to do the evaluation, planning, and development work.
 - The incorporation of mini/micros into distributed processing systems requires new software which end users may not have the ability to produce.
 - The need for qualified personnel in this sector adds to the overall industry shortage which is expected to continue through this decade.
 - The low capital investment required in the software and professional services sector will attract more entrepreneurs. Users should look to this pool of talent for unique products and services, rather than attempting to enlarge in-house staffs.
- Based on current levels of activity, finance and banking, health care, legal, and discrete and process manufacturing are expanding markets where users can expect to find a profusion of professional services being offered.

2. SIGNIFICANT ANNOUNCEMENTS

- Events of significance which occurred in the services industry in 1978 include the following:
- Automatic Data Processing's Network Services Division installed the first of its Onsite computers, introduced earlier this year as an extension to its traditional timesharing services at General Motors in Detroit.

- National CSS, which in the spring introduced the IBM compatible 3200 Series computer, has installed the first system at its Sunnyvale, California office for customer testing. Users will be able to test the machine through National CSS' timesharing network.
- The State of California has awarded Computer Sciences Corporation a \$129.6 million contract to process claims for the state's Medi-Cal program, the California version of Medicaid.
 - The 5½ year contract is the largest services contract ever let by the state.
 - Computer Sciences (CSC) will serve as fiscal intermediary between the Department of Health, and the hospitals, clinics, pharmacies, doctors and others that provide health care services to Medi-Cal recipients.
 - About 80 million claim transactions are processed annually and the Department of Health expects this figure to exceed 100 million in five years.
- Due to its importance and growth rate, the medical information services field is being entered by a number of large timesharing firms. Entrants include:
 - Itel is building its capability with the acquisitions of Health Control Corporation, Medical Arts, and Medical Data Systems.
 - Computer Sciences Corporation made a deal in late 1977 for Paid Prescriptions.
 - Control Data Corporation has entered negotiations with Life Extension Institute, Inc., Interhealth, Inc., and Health Consultants of Denver, Inc.
 - Tymshare, which already owns Medical Data Systems, announced its intention to acquire Medical Information, Inc.

- In keeping with the trend of timesharing services firms, Shared Medical Services Co., already a leader in the medical services field, is offering small systems for on-site use in conjunction with its headquarter's mainframes.
- Tymshare and Itel have also announced their intentions to furnish small computers to their customers in the medical services industry for use in conjunction with host oriented systems.
- More than 200 U.S. and Canadian banks have simplified the management of their complex trust accounts with services provided by SEI Corporation - a trust accounting services firm. Users access their trust account information and automatically manage cash positions each day using a battery of Prime 400 computers.
- Sun Information Services Co., signed a letter of intent to acquire the computing division of Metridata Computing, Inc., for an undisclosed amount of cash.
 - Metridata, which reported revenues of \$5.4 million in 1977, provides management services to 35 banks and timesharing services to about 100 Midwestern customers.
- Tymshare, Inc., an international computer service supplier, and DMI, a New York software firm, have agreed to jointly market Ibis, an international banking information system.
 - Ibis operates in real time mode on PDP-11, models 34 through 70.
 - Software functions include foreign exchange processing, loans and placements, foreign time and deposit administration, general ledgers, accounting and daily and monthly management reporting.
- Computer Sciences Corporation has been selected by the National Aeronautics and Space Administration to provide computer systems engineering and data

processing support services to NASA's Johnson Space Center at Houston, Texas.

- Total value is estimated at \$65-70 million over the full five-year period.
- Computer Sciences will support NASA's manned flight missions at the Johnson Space Center with systems engineering, planning, design, development, installation, and test of both large- and small-scale computer-based systems.
- National Data Corporation (NDC) announced that it has reached its Phase I goal of 25 leading cash management banks participating in its balance reporting service.
 - Information is exchanged daily from over 250 banks to over 1000 end users worldwide through this bank to corporate EFT network which offers the user participation in the exchange of cash management information.
- Optimum Systems has been awarded a contract to support the Medicare operations of the Aetna Life & Casualty Co., Hartford, Connecticut in six states.
 - The contract, claimed to be worth more than \$5 million over its three year term, will cover use of Optimum's Medicare B claims processing software on Aetna's own computers.
- General Electric Company's Mark III timesharing service is being used in conjunction with Communications Satellite Corporation facilities to link an IBM 370/158 at Pennwalt Corporation, Philadelphia, Pennsylvania to plants and offices in 19 nations as part of an international accounting information system.

- The Datafile division of NLT Computer Services introduced a line of small systems for wholesale distributors to supplement its on-line network offerings to that industry.
- For the past 12 years, Keydata Corporation has been delivering "on-line" computer services to small- and medium-size businesses via terminals located in the businesses' offices. Now, Keydata is selling and installing computer systems for small businesses, complete with business software.
 - Intended initially for distributors in the electrical, plumbing, heating and air conditioning, and industrial supply industries, the systems include specially designed, integrated application software, which the supplier tailors to meet the specific needs of each business using the systems.
 - Keydata also announced plans to market a distributed processing system using the new HP 300 small business computer.
- Tymshare released Perval, an on-line investment fund analysis system designed for interactive use on the firm's timesharing network.
 - The system is designed to help fund sponsors and money managers evaluate their holdings and future transactions.
- Scientific Time Sharing Corporation announced plans to market an IBM 370 compatible computer with its APL/PLUS timesharing software for in-house use.

APPENDIX A: INTERVIEW PROGRAM

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- A total of 499 interviews were obtained for the 1978 User Planning Service Annual Report. Of these, 50 personal interviews were conducted by telephone and on-site visits during August and September. The remainder were mail questionnaires received from respondents to INPUT's EDP User Panel survey during a period from March to August.
- Exhibit A-I provides a distribution of respondents by industry sector. As indicated, the two manufacturing sectors account for 37% of the responses and the two financially oriented sectors, banking and insurance, account for 24%.
 - Government accounts for only one percent of the total and is included in the Services and Other category.
- Respondents interviewed directly tended to be from large companies, and for the most part were managers or executives associated with the corporate level activity. Of these interviews, approximately half, 28 of 50, were with EDP managers (see Questionnaire Exhibit D-3) and the remainder 22 of 50 were with EDP executives (see Questionnaire Exhibit D-4).
- The EDP User Panel questionnaires were sent to EDP managers and executives at two separate times during 1978. The first group of 1,000 (see Questionnaire Exhibit D-1) were sent in February and resulted in 183 responses

EXHIBIT A-I

DISTRIBUTION OF RESPONDENTS BY INDUSTRY SECTOR

SECTOR	EDP USER PANEL QUESTION- NAIRE	TELEPHONE OR SITE CONTACT	TOTAL	PERCENT OF TOTAL
DISCRETE MANUFACTURING	87	8	97	19.4%
PROCESS MANUFACTURING	77	9	86	17.2
TRANSPORTATION	20	3	23	4.6
UTILITIES	22	4	26	5.2
WHOLESALE DISTRIBUTION	19	1	20	4.0
RETAIL DISTRIBUTION	23	1	24	4.8
BANKING AND FINANCE	49	9	58	11.6
INSURANCE	59	5	64	12.8
EDUCATION, SERVICES, AND OTHER	93	10	103	20.6
TOTAL	449	50	499	100.0%

from March to May. The second group of 2,000 (see Questionnaire Exhibit D-3) were sent in June and resulted in 266 responses received in July and August.

- The User Panel recipients included EDP managers located not only at central and headquarters EDP locations but also EDP managers at branches and divisions. As indicated in the body of the report, more than one half of the respondents were from organizations in the \$100 million to \$1 billion annual revenue size category. The remainder were fairly evenly distributed among smaller (less than \$100 million) and larger (greater than \$1 billion) sized companies.
- As another measure of how typical the respondents to the EDP User Panel were, Exhibit A-2 provides a summary of responses to questions associated with mainframe hardware vendors. As shown, the results reasonably resemble the distribution of equipment expected to be found in the commercial EDP environment.

EXHIBIT A-2

DISTRIBUTION OF RESPONDENTS BY MAINFRAME VENDOR (EDP USER PANEL ONLY)

VENDOR	NUMBER	PERCENT OF TOTAL
AMDAHL	1	0.2%
BURROUGHS	26	6.2
CONTROL DATA	6	1.4
DEC	9	2.1
HONEYWELL	23	5.4
IBM	272	64.9
ITEL	2	0.5
NCR	11	2.6
SPERRY-UNIVAC	23	5.4
OTHER AND UNSPECIFIED	30	7.2
MIXED SHOP	17	4.0
TOTAL	420	100.0%

APPENDIX B: INDUSTRY SECTOR DEMOGRAPHIC DATA

EXHIBIT B-1

DISCRETE MANUFACTURING INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
ALL	ALL	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$538.1 BILLION 184,642 10.7 BILLION
23	APPAREL	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$34.8 BILLION 22,638 1.3 MILLION
25	FURNITURE	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$14.2 BILLION 8,529 425,600
27	PRINTING	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$42.8 BILLION 40,713 1.08 MILLION
31	LEATHER	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$7.1 BILLION 2,846 247,100
34	METAL	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$77.5 BILLION 28,459 1.5 MILLION
35	MACHINERY	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$105.5 BILLION 40,620 1.95 MILLION
36	ELECTRONICS	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$73.9 BILLION 12,062 1.57 MILLION
37	TRANSPORTATION	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$141.0 BILLION 8,246 1.7 MILLION

EXHIBIT B-1 (CONTD)

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
38	SCIENTIFIC AND CONTROL INSTRUMENTS	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	25.0 BILLION 6,074 518,000
39	MISCELLANEOUS MANUFACTURERS	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$16.3 BILLION 14,455 410,000

EXHIBIT B-2

PROCESS MANUFACTURING INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
ALL	ALL	VALUE OF SHIPMENTS NUMBER OF ESTABLISHMENTS NUMBER OF EMPLOYEES	\$882.7 BILLION 144,560 8.0 MILLION
10	METAL MINING	VALUE OF SHIPMENTS (1975) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975)	\$5.2 BILLION 775 92,300
11	ANTHRACITE MINING	VALUE OF SHIPMENTS (1975) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975)	\$198.5 MILLION 70 3,600
12	COAL MINING	VALUE OF SHIPMENTS (1975) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975)	\$12.5 BILLION 3,801 198,000
13	OIL AND GAS EXTRACTION	VALUE OF SHIPMENTS (1975) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975)	\$34.8 BILLION 13,257 335,700
20	FOOD PRODUCTS	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$180.9 BILLION 24,500 1.5 MILLION
21	TOBACCO	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1976) NUMBER OF EMPLOYEES (1976)	\$8.7 BILLION 166 64,800
22	TEXTILE PRODUCTS	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$36.4 BILLION 6,693 875,800
24	LUMBER AND WOOD PRODUCTS	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$31.2 BILLION 22,943 628,700

EXHIBIT B-2 (CONTD)

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
26	PAPER PRODUCTS	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$48.2 BILLION 5,874 614,800
28	CHEMICALS	NUMBER OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$104.1 BILLION 10,957 851,200
29	PETROLEUM	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$82.3 BILLION 1,977 144,500
30	RUBBER AND PLASTICS	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975)	\$31.8 BILLION 9,425 627,400
32	STONE, GLASS CLAY	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$30.6 BILLION 15,553 599,000
34	PRIMARY METALS	VALUE OF SHIPMENTS (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$77.5 BILLION 28,459 1.5 MILLION

EXHIBIT B-3
TRANSPORTATION INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
ALL	ALL	OPERATING REVENUES NUMBER OF ESTABLISHMENTS NUMBER OF EMPLOYEES	\$75.9 BILLION 134,559 3.1 MILLION
40	RAILROADS	OPERATING REVENUES (1975) NUMBER OF OPERATING COM- PANIES (1974) NUMBER OF EMPLOYEES (1974)	\$17.7 BILLION 341 541,000
41	LOCAL AND SUB- URBAN TRANSIT	OPERATING REVENUES (1974) NUMBER OF ESTABLISHMENTS (1975) NUMBER OF EMPLOYEES (1975)	\$1.4 BILLION 13,181 308,000
42	MOTOR FREIGHT (NON ICC)	OPERATING REVENUES (1972) NUMBER OF ESTABLISHMENTS (1972) NUMBER OF EMPLOYEES (1972)	\$7.8 BILLION 63,000 328,000
42	MOTOR FREIGHT (ICC CLASS I)	OPERATING REVENUES (1973) NUMBER OF ESTABLISHMENTS (1973) NUMBER OF EMPLOYEES (1973)	\$16.6 BILLION 1,500 580,000
43	U.S. POSTAL SERVICE	OPERATING REVENUES (1976) NUMBER OF POST OFFICES (1976) NUMBER OF EMPLOYEES (1976)	\$12.8 BILLION 30,521 679,000
44	WATER TRANSPORTATION	OPERATING REVENUES (1975) NUMBER OF ESTABLISHMENTS (1975) NUMBER OF EMPLOYEES (1975)	\$946.0 MILLION 5,841 184,000
45	AIR TRANSPORTATION	OPERATING REVENUES (1975) NUMBER OF AIR CARRIERS (1975) NUMBER OF EMPLOYEES (1976)	\$15.4 BILLION 4,738 370,000
46	PIPELINES	OPERATING REVENUES (1975) NUMBER OF ESTABLISHMENTS (1975) EMPLOYEES (1975)	\$1.9 BILLION 437 19,400

EXHIBIT B-3 (CONTD)

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
47	TRANSPORTATION SERVICES	OPERATING REVENUES (1972) NUMBER OF ESTABLISHMENTS (1975) NUMBER OF EMPLOYEES (1975)	\$1.4 BILLION 15,000 136,000

EXHIBIT B-4

UTILITIES INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
ALL	ALL	OPERATING REVENUES NUMBER OF ESTABLISHMENTS NUMBER OF EMPLOYEES	\$127.7 BILLION 22,140 1.9 MILLION
481	TELEPHONE COMMUNICATIONS	OPERATING REVENUES (1976) NUMBER OF COMPANIES (1976) NUMBER OF EMPLOYEES (1976)	\$39.0 BILLION 1,622 930,000
482	TELEGRAPH COMPANIES	OPERATING REVENUES (1975) NUMBER OF COMPANIES (1975) NUMBER OF EMPLOYEES (1976)	\$821 MILLION 7 19,000
483	RADIO AND T.V. BROADCASTING	OPERATING REVENUES (1976) NUMBER OF STATIONS (1975) NUMBER OF EMPLOYEES (1976)	\$6.8 BILLION 6,228 157,000
489	COMMUNICATIONS SERVICES (N.E.C.)	OPERATING REVENUES (1974) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975)	\$1.0 BILLION 2,422 35,000
491	ELECTRIC SERVICES	OPERATING REVENUES (1976) NUMBER OF PLANTS (1975) NUMBER OF EMPLOYEES (1976)	\$53.5 BILLION 3,769 315,000
492	GAS PRODUCTS AND SERVICES	OPERATING REVENUES (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$23.7 BILLION 1,675 160,000
493	COMBINED GAS AND ELECTRIC	OPERATING REVENUES (1974) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$1.9 BILLION 877 194,000
494/ 495	WATER SUPPLY/ SANITATION	OPERATING REVENUES (1974) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1976)	\$1.0 BILLION 5,547 67,000

EXHIBIT B-5
WHOLESALE INDUSTRY SECTOR
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
ALL	ALL	SALES: TOTAL (1976) SALES: MERCHANT WHOLESALERS NUMBER OF ESTABLISHMENTS: TOTAL NUMBER OF EMPLOYEES	\$922 BILLION 482 BILLION 351,000 4.1 MILLION
50	DURABLE GOODS	SALES (MERCHANT WHOLESALERS) NUMBER OF ESTABLISHMENTS NUMBER OF EMPLOYEES	\$210 BILLION 207,000 2.4 MILLION
		SALES BREAKDOWN (MAJOR CATEGORIES, 1975)	
		MOTOR VEHICLES, AUTOMOTIVE EQUIPMENT ELECTRICAL GOODS HARDWARE, PLUMBING, HEATING EQUIPMENT, ETC. MACHINERY, EQUIPMENT, SUPPLIES METALS, METALWORK (INCLUDING SCRAP) OTHER, MISC.	\$36.6 BILLION 26.6 BILLION 18.9 BILLION 56.9 BILLION 37.0 BILLION 33.7 BILLION
51	NON-DURABLE GOODS	SALES (MERCHANT WHOLESALERS) NUMBER OF ESTABLISHMENTS NUMBER OF EMPLOYEES	\$272 BILLION 144,000 1.7 MILLION
		SALES BREAKDOWN (MAJOR CATEGORIES, 1976)	
		GROCERIES AND RELATED PRODUCTS BEER, WINE, DISTILLED ALCOHOLIC BEVERAGES DRUGS, CHEMICALS, ALLIED PRODUCTS TOBACCO, TOBACCO PRODUCTS PAPERGOODS, PAPER PRODUCTS DRY GOODS, APPAREL FARM PRODUCTS OTHER, MISC.	\$98.8 BILLION 22.2 BILLION 16.6 BILLION 9.3 BILLION 12.6 BILLION 17.0 BILLION 48.7 BILLION 46.8 BILLION

EXHIBIT B-6
RETAIL INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
ALL	RETAIL TRADE	SALES (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975)	\$651.9 BILLION 1.2 MILLION 12.3 MILLION
52	BUILDING MATERIALS, HARDWARE	SALES (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975) AVERAGE SALES/EMPLOYEE	\$38.8 BILLION 59,817 413,000 \$93,900
53	GENERAL MERCHANDISE	SALES (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975) AVERAGE SALES/EMPLOYEE	\$104.2 BILLION 41,817 1.9 MILLION \$54,800
54	FOOD STORES	SALES (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975) AVERAGE SALES/EMPLOYEE	\$141.0 BILLION 159,710 1.8 MILLION \$78,300
55	AUTOMOTIVE DEALERS & GASOLINE SERVICE STATIONS	SALES (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975) AVERAGE SALES/EMPLOYEE	\$28.6 BILLION 231,294 1.6 MILLION \$108,300
56	APPAREL & ACCESSORIES	SALES (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975) AVERAGE SALES/EMPLOYEE	\$28.6 BILLION 109,291 810,000 \$35,300
57	FURNITURE, HOME FURNISHINGS EQUIPMENT	SALES (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975) AVERAGE SALES/EMPLOYEE	\$29.0 BILLION 78,327 472,000 \$16,400
58	EATING & DRINKING	SALES (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975) AVERAGE SALES/EMPLOYEE	\$52.3 BILLION 265,118 3.1 MILLION \$16,900
59	MISCELLANEOUS RETAIL	SALES (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975) AVERAGE SALES/EMPLOYEE	\$46.0 BILLION 235,465 1.6 MILLION \$28,800

EXHIBIT B-7
BANKING AND FINANCE INDUSTRY SECTOR -
DEMOGRAPHIC DATA (1975)

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
ALL	ALL	NUMBER OF ESTABLISHMENTS NUMBER OF EMPLOYEES	111,000 2.0 MILLION
60	BANKS	NUMBER OF ESTABLISHMENTS NUMBER OF EMPLOYEES	39,904 1,207,619
601	FEDERAL RESERVE BANKS	ASSETS NUMBER OF ESTABLISHMENTS NUMBER OF EMPLOYEES	\$120 BILLION 49 27,000
602	COMMERCIAL BANK	ASSETS NUMBER OF ESTABLISHMENTS NUMBER OF EMPLOYEES	\$965 BILLION 35,642 1.1 MILLION
603	MUTUAL SAVINGS BANKS	ASSETS NUMBER OF ESTABLISHMENTS NUMBER OF EMPLOYEES	\$121 MILLION 1,700 42,000
61	CREDIT AGENCIES (OTHER THAN BANKS)	NUMBER OF ESTABLISHMENTS NUMBER OF EMPLOYEES	52,000 436,000
612	SAVINGS AND LOAN ASSOCIATIONS	ASSETS NUMBER OF ASSOCIATIONS NUMBER OF ESTABLISHMENTS NUMBER OF EMPLOYEES	\$338 BILLION 5,000 11,000 155,000
612	CREDIT UNIONS	ASSETS NUMBER OF CREDIT UNIONS NUMBER OF ESTABLISHMENTS NUMBER OF EMPLOYEES	\$47 BILLION 23,000 35,000 191,000
62	SECURITY, COMMODITY BROKERS, AND SERVICES	NUMBER OF ESTABLISHMENTS NUMBER OF EMPLOYEES	8,400 165,000
67	HOLDING AND OTHER INVESTMENT COMPANIES	NUMBER OF ESTABLISHMENTS NUMBER OF EMPLOYEES	10,600 147,000

EXHIBIT B-8

INSURANCE INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
63	INSURANCE (LIFE, HEALTH, PROPERTY, CASUALTY)	NUMBER OF EMPLOYEES (1976)	\$1.1 MILLION
		NUMBER OF ESTABLISHMENTS (1975)	25,516
		PROPERTY AND LIABILITY PREMIUMS WRITTEN (1975)	\$49.9 BILLION
		LIFE INSURANCE, PREMIUM RECEIPTS (1976)	\$31.4 BILLION
		ANNUITY INSURANCE, PREMIUM RECEIPTS (1976)	\$14.0 BILLION
64	INSURANCE AGENTS, BROKERS AND SERVICE	HEALTH INSURANCE, PREMIUM RECEIPTS (1976)	\$21.1 BILLION
		INVESTMENT INCOME (1976)	\$22.2 BILLION
		NUMBER OF EMPLOYEES (1976)	342,341
		NUMBER OF ESTABLISHMENTS (1976)	68,156

EXHIBIT B-9

EDUCATION INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
82	ALL	NUMBER OF EMPLOYEES (1975)	957,131
	ELEMENTARY/ SECONDARY	SCHOOL EXPENDITURES (1977) ENROLLMENTS (1976)	\$81.9 BILLION 47.7 MILLION
		NUMBER OF SCHOOLS (1975) NUMBER OF SCHOOL DISTRICTS (1975-1976)	107,000 16,400
	HIGHER EDUCATION	SCHOOL EXPENDITURES (1977)	\$49.2 BILLION
		ENROLLMENTS (1977) NUMBER OF COLLEGES (1976)	11.4 MILLION 2,785

EXHIBIT B-10
SERVICE AND OTHER INDUSTRY SECTOR -
DEMOGRAPHIC DATA

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
78	MOTION PICTURES	SALES (1976) NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975)	\$3.0 BILLION 14,515 181,241
79	RECREATION	SALES NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975)	\$8.7 MILLION 42,732 522,563
83	SOCIAL SERVICES	SALES NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975)	\$2.9 BILLION 39,893 647,918
84	MUSEUMS, ETC.	SALES NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES	\$150 MILLION 790 21,779
86	MEMBERSHIP ORGANIZATIONS	SALES NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975)	\$12.2 BILLION 131,255 1.0 MILLION
89	MISCELLANEOUS SERVICES	SALES NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975)	\$7.3 BILLION 62,883 617,914
99	NON-CLASSIFIABLE	SALES NUMBER OF ESTABLISHMENTS(1975) NUMBER OF EMPLOYEES (1975)	\$4.8 BILLION 204,319 496,244

EXHIBIT B-10 (CONTD)

INDUSTRY SIC	INDUSTRY NAME	TYPE OF STATISTIC	DATA
ALL		SALES NUMBER OF ESTABLISHMENTS NUMBER OF EMPLOYEES	\$460 BILLION 2.3 MILLION 10.2 MILLION
01-09	AGRICULTURE, FORESTRY, FISHING	SALES NUMBER OF ESTABLISHMENTS (1975) NUMBER OF EMPLOYEES (1975)	\$101 BILLION 39,979 195,145
15-17	CONSTRUCTION	SALES NUMBER OF ESTABLISHMENTS (1975) NUMBER OF EMPLOYEES (1975)	\$161.1 BILLION 363,725 3.3 MILLION
65	REAL ESTATE	SALES NUMBER OF ESTABLISHMENTS (1975) NUMBER OF EMPLOYEES (1975)	\$88.6 BILLION 159,640 789,707
66	REAL ESTATE, INSURANCE	SALES NUMBER OF ESTABLISHMENTS (1975) NUMBER OF EMPLOYEES (1975)	\$247 MILLION 7,514 28,776
70	HOTELS, ETC.	SALES (1976) NUMBER OF ESTABLISHMENTS (1975) NUMBER OF EMPLOYEES (1975)	\$12.2 BILLION 45,060 839,699
72	PERSONAL SERVICES	SALES (1976) NUMBER OF ESTABLISHMENTS (1975) NUMBER OF EMPLOYEES (1975)	\$16.7 BILLION 161,058 875,056
75	AUTO REPAIR	SALES (1976) NUMBER OF ESTABLISHMENTS (1975) NUMBER OF EMPLOYEES (1975)	\$19.0 BILLION 84,814 409,979
76	MISCELLANEOUS REPAIR	SALES NUMBER OF ESTABLISHMENTS (1975) NUMBER OF EMPLOYEES (1975)	\$6 MILLION 44,435 227,399

APPENDIX C: DEFINITIONS

APPENDIX C: DEFINITIONS

- Computer equipment includes any locally installed terminal, minicomputer, or mainframe.
 - A small business computer is a system that is built around a central processing unit (CPU), and that has the ability of utilizing at least 20m bytes of disk capacity, provides multiple CRT workstations, and offers business-oriented system software support.
 - A minicomputer is usually a 12 or 16 bit computer which is provided with limited applications software and support.
 - A turnkey system is composed of hardware and software integrated into a total system designed to fulfill completely the processing requirements of a single application.
 - A large scale system is equivalent or greater in power than an IBM 370/168, costing more than \$4 million, and having the following "proper" functions.
 - . Heavy computation.
 - . Transaction processing against large data bases.

- RJE replacement of smaller standalone batches.
- Distributed Data Processing (DDP) is the deployment of programmable intelligence in order to perform data processing functions where they can be accomplished most effectively, through the electronic interconnection of computers and terminals, arranged in a telecommunications network adopted to the user's characteristics.
- Software products are systems and applications packages for use on in-house computer systems. Expenditures include leases and purchases, as well as fees for work performed by the vendor to implement and maintain the package at the users' sites. Fees for work performed by organizations other than the package vendor are counted in professional services. Software products includes two categories:
 - Systems Packages are operating systems, utilities, and language routines that enable the computer/communications system to perform basic functions. This software is provided by the mainframe manufacturers with their hardware; other vendors provide improved versions of this and special purpose routines. This classification includes compilers, data base management software, communications packages, simulators, performance measurement software, diagnostic software, and sorts.
 - Applications Packages are software which perform processing to serve user functions. They consist of general purpose packages, such as for accounting and inventory control, and special purpose packages, such as personal trust, airline scheduling, and demand deposit accounting.
- Computer services are provided by vendors which perform data processing functions using vendor computers, or assist users to perform such functions on their own computers.

- Included are remote computing services (RCS), batch services, facilities management, professional services, and software products.
- Remote computing services (RCS) are a provision of data processing to a user by means of terminals at the user's site(s) connected by a data communications network to the vendor's central computer. The three sub-modes of RCS are:
 - Interactive timesharing is characterized by interaction of the user with the system, primarily for problem solving timesharing, but also for data entry and transaction processing (i.e., the user is "on-line" to the program/files).
 - Remote Batch is where the user hands over control of a job to the vendor's computer which schedules job execution according to priorities and resource requirements.
 - Data Base is characterized by the retrieval of information from a vendor-maintained data base. This may be owned by the vendor or a third party.
- Batch services include data processing performed at vendor's sites of user programs and/or data which are physically transported (as opposed to electronically by telecommunications media) to and/or from those sites. Data entry and data output services, such as keypunching and com processing are also included. Batch services include those expenditures by users which take their data to a vendor site which has a terminal connected to a remote computer used for the actual processing.
- Processing services encompass facilities management (FM), remote computing services (RCS), and batch services. They are also categorized by type of service, as distinguished from mode of service, bought by users as follows:
 - General business services are processing services for applications which are common to users across industry categories. Software is provided

by the vendor. This can be a complete package, such as a payroll package, or an application "tool," such as a budgeting model, where a user provides much of the customizing of the finished product it uses. General business processing is often repetitive and transaction oriented.

- Scientific and engineering services are the processing of scientific and engineering problems for users across industries. The problems usually involve the solution of mathematical equations. Processing is generally problem solving and is non-repetitive, except in the sense that the same packages or "tools" are used to address different, but similar, problems.
- Industry specialty services provide processing for particular functions or problems unique to an industry or industry group. The software is provided by the vendor either as a complete package or as an applicaiton "tool" which the user employs to produce its unique solution. Specialty applications can be either business or scientific in orientation. Data base services where the vendor supplies the data base and controls access to it (although it may be owned by a third party) are also included under this category. Examples of industry specialty applications are: seismic data processing, numerically-controlled machine tool software development, and demand deposit accounting.
- Utility services are those where the vendor provides access to a computer and/or communications network with basic software that enables any user to develop its own problem solution or processing system. The basic tools include terminal handling software, information retrieval software, scientific library routines, and other systems software.
- Communications services include direct dial long distance (DDD), WATS, leased lines, tie lines, TELEX/TWX, or other regulated transmission of voice or data.

- Office equipment includes word processing, photocopiers, duplication machines, and facsimile equipment.
 - Text editing is the movement of words inside a single document.
 - Text processing includes text editing and the functions of text storage and retrieval, generation of text, and distribution of text.

APPENDIX D: QUESTIONNAIRES

EDP USER QUESTIONNAIRE

GENERAL INFORMATION

Primary SIC (if available) _____ Total Number of Employees _____
Primary Business _____ Number of EDP Employees _____
Annual Sales _____ Today's Date _____

EDP PLANS

1. Please indicate the level of centralization of EDP in your company.
A) ☐ Centralized B) ☐ Partially centralized C) ☐ Decentralized
2. What major objectives do you have for EDP?
In 1978 _____
In 1979 _____
In 1980 _____
3. What are the most significant EDP problems in your organization which you would like to see resolved?

4. In order of priority, what will be the new applications you will develop or require within the next 2 years?
1. _____
2. _____
3. _____
4. _____
5. _____
5. Do you do comparison studies on the cost of outside services/software versus performing these functions in-house?
A) ☐ Yes B) ☐ No
6. Please indicate any questions you would like to see addressed in studies of EDP users. _____

EXPENDITURES

A. Overall EDP Budget

1. What is your total annual EDP budget? (If you can't give an absolute figure, please list as a percentage of total company sales.)
A) \$ _____ or B) _____ %

2. Please indicate in percentages how your EDP budget will be spent in 1978 and anticipated changes in 1979 and 1980, if known.

CATEGORY	% OF TOTAL EDP BUDGET		
	1978	1979	1980
A) Main computer processors	____%	____%	____%
B) Small computers/programmable terminals	____%	____%	____%
C) Non-programmable terminals	____%	____%	____%
D) Communications	____%	____%	____%
E) Software (purchase/lease)	____%	____%	____%
F) Personnel	____%	____%	____%
G) Other_____	____%	____%	____%
	100%	100%	100%

B. Outside Computer Services and Software Expenditures

1. If you use outside computer services or software, please complete the following chart. (Select the application codes from the list provided below.

TYPE OF SERVICE	1977 EXPENDITURES	1978 EXPENDITURES	% CHANGE 1978/80	VENDOR(S)	APPLICATION CODE(S)
PROCESSING SERVICES					
A) Interactive timesharing	\$ _____	\$ _____	____%	_____	_____
B) Remote batch	\$ _____	\$ _____	____%	_____	_____
C) Batch	\$ _____	\$ _____	____%	_____	_____
D) Input/output (com, data, entry, etc)	\$ _____	\$ _____	____%	_____	_____
SOFTWARE PRODUCTS					NAMES OF PRODUCTS ACQUIRED IN 1977
E) Systems software (incl. DBMS)	\$ _____	\$ _____	____%	_____	_____
F) Applications software	\$ _____	\$ _____	____%	_____	_____
PROFESSIONAL SERVICES					
G) Contract programming & design	\$ _____	\$ _____	____%	_____	_____
H) EDP consulting	\$ _____	\$ _____	____%	_____	_____
I) Education	\$ _____	\$ _____	____%	_____	_____
J) Other	\$ _____	\$ _____	____%	_____	_____
FACILITIES MANAGEMENT					
K)	\$ _____	\$ _____	____%	_____	_____
MAINTENANCE					
L)	\$ _____	\$ _____	____%	_____	_____

Total expenditures for outside services \$ _____ \$ _____

APPLICATION CODES:

- | | | |
|--------------------------|-----------------------------|-----------------------------------|
| 1. Vendor data bases | 5. Planning & modeling | 9. Industry specialty application |
| 2. Program development | 6. Finance & accounting | 10. Other (specify) _____ |
| 3. Network consolidation | 7. Marketing & sales | _____ |
| 4. Raw computer time | 8. Scientific & engineering | _____ |

2. If you do not use outside services, are there any EDP functions or application processing you would consider contracting out?
 A) ☐ Yes B) ☐ No
 If yes, please specify _____

 If no, why not? _____

3. Have you replaced or considered replacing any outside data processing service with an in-house minicomputer or microcomputer?
 A) ☐ Yes, we have replaced.
 Reason: _____
 B) ☐ We have considered replacement.
 Reason: _____
 C) ☐ No, replacement has not occurred nor have we considered it.
4. Are you looking for application software to assist in implementing or developing new applications?
 A) ☐ Yes B) ☐ No
 If yes, which application areas? _____

 If no, why not? _____

5. Have you considered or would you consider facilities management?
 A) ☐ Yes B) ☐ No
6. Under which conditions might you consider facilities management? _____

INSTALLED HARDWARE

1. Please identify the major computers you have installed (equivalent of a 370/135 or larger).
- | | MANUFACTURER | MODEL NUMBER | QUANTITY | OPERATING SYSTEM |
|----|--------------|--------------|----------|------------------|
| A) | _____ | _____ | _____ | _____ |
| B) | _____ | _____ | _____ | _____ |
| C) | _____ | _____ | _____ | _____ |
2. Please identify the number of minicomputers installed (include small business computers and process control units).
 0) ☐ None 1) ☐ 1-5 2) ☐ 5-10 3) ☐ 10-20 4) ☐ 20-50 5) ☐ 50-100 6) ☐ >100
 A. Projected installation growth between 1977/78 A) _____% 1978/80 B) _____%
3. Major suppliers of your minicomputers:
- | | MANUFACTURER | MODEL NUMBER | QUANTITY |
|----|--------------|--------------|----------|
| A) | _____ | _____ | _____ |
| B) | _____ | _____ | _____ |
| C) | _____ | _____ | _____ |
4. How many terminals (total number) do you have installed?
 0) ☐ None 1) ☐ 1-10 2) ☐ 10-50 3) ☐ 50-100 4) ☐ 100-500 5) ☐ >500
 A. Projected installation growth between 1977/78 A) _____% 1978/80 B) _____%

5. Of the following uses of terminals, please rate by significance the most important reasons for terminal acquisition over the next 3 years. (1 = most significant, 5 = least significant.)

TYPE OF TERMINAL USE	RATING
A) Source input	_____
B) Data base inquiry	_____
C) Distributed processing	_____
D) Interactive timesharing	_____
E) Remote job entry	_____
F) Graphics	_____
G) Other_____	_____

6. Have you installed or do you have plans to install any turnkey minicomputer systems?

A) ☐ Have installed

Please specify application(s)_____

B) ☐ Plan to install

Please specify application(s)_____

C) ☐ No plans or installations

7. In your opinion, what do you consider was the most significant industry development in computer/communications in 1977?_____

EDP ISSUES

A. Data Base Management Systems (DBMS)

1. Please indicate the DBMS installed on your in-house computer and your level of satisfaction. (1 = highly satisfied, 5 = dissatisfied.)

DBMS NAME	DEVELOPER	DATE OF INSTALLATION	LEVEL OF SATISFACTION
A) _____	_____	_____	_____
B) _____	_____	_____	_____
C) <input type="checkbox"/> None			

2. Please indicate any DBMS services you use through an outside vendor, year service began and level of satisfaction (1 = highly satisfied, 5 = dissatisfied.)

DBMS NAME	VENDOR	YEAR SERVICE BEGAN	LEVEL OF SATISFACTION
A) _____	_____	_____	_____
B) _____	_____	_____	_____
C) <input type="checkbox"/> None			

3. Are you currently evaluating one or more DBMS products?

A) ☐ Yes

B) ☐ No

B. Distributed Processing

1. What is your involvement in distributed processing?

A) ☐ Distributed processing system is installed

B) ☐ Currently implementing a distributed processing system

C) ☐ Distributed processing is under consideration

D) ☐ Distributed processing is not applicable to our business

2. How are you using or plan to use distributed processing?_____

EDP USER QUESTIONNAIRE

GENERAL INFORMATION

Primary SIC (if available) _____ Total Number of Employees _____
Primary Business _____ Number of EDP Employees _____
Annual Sales _____ Today's Date _____

EDP PLANS

1. Please indicate the level of centralization of EDP in your company.
A) ☐ Centralized B) ☐ Partially centralized C) ☐ Decentralized
2. What major objectives do you have for EDP?
In 1978 _____
In 1979 _____
In 1980 _____
3. What are the most significant EDP problems in your organization which you would like to see resolved?

4. In order of priority, what will be the new applications you will develop or require within the next 2 years?
1. _____
2. _____
3. _____
4. _____
5. _____
5. Do you do comparison studies on the cost of outside services/software versus performing these functions in-house?
A) ☐ Yes B) ☐ No
6. Please indicate any questions you would like to see addressed in studies of EDP users. _____

EXPENDITURES

A. Overall EDP Budget

1. What is your total annual EDP budget? (If you can't give an absolute figure, please list as a percentage of total company sales.)
A) \$ _____ or B) _____ %

2. Please indicate in percentages how your EDP budget will be spent in 1978 and anticipated changes in 1979 and 1980, if known.

CATEGORY	% OF TOTAL EDP BUDGET		
	1978	1979	1980
A) Main computer processors	____%	____%	____%
B) Small computers/programmable terminals	____%	____%	____%
C) Non-programmable terminals	____%	____%	____%
D) Communications	____%	____%	____%
E) Software (purchase/lease)	____%	____%	____%
F) Personnel	____%	____%	____%
G) Other _____	____%	____%	____%
	100%	100%	100%

B. Outside Computer Services and Software Expenditures

1. If you use outside computer services or software, please complete the following chart. (Select the application codes from the list provided below.)

TYPE OF SERVICE	1977 EXPENDITURES	1978 EXPENDITURES	% CHANGE 1978 TO 1980	VENDOR(S)	APPLICATION CODE(S)
PROCESSING SERVICES					
A) Interactive timesharing	\$ _____	\$ _____	____%	_____	_____
B) Remote batch	\$ _____	\$ _____	____%	_____	_____
C) Batch	\$ _____	\$ _____	____%	_____	_____
D) Input/output (com, data, entry, etc)	\$ _____	\$ _____	____%	_____	_____
SOFTWARE PRODUCTS					NAMES OF PRO- DUCTS ACQUIR- ED IN 1977
E) Systems software (incl. DBMS)	\$ _____	\$ _____	____%	_____	_____
F) Applications software	\$ _____	\$ _____	____%	_____	_____
PROFESSIONAL SERVICES					
G) Contract programming & design	\$ _____	\$ _____	____%	_____	
H) EDP consulting	\$ _____	\$ _____	____%	_____	
I) Education	\$ _____	\$ _____	____%	_____	
J) Other	\$ _____	\$ _____	____%	_____	
FACILITIES MANAGEMENT					
K)	\$ _____	\$ _____	____%	_____	
MAINTENANCE					
L)	\$ _____	\$ _____	____%	_____	

Total expenditures for outside services \$ _____ \$ _____

APPLICATION CODES:

- | | | |
|--------------------------|-----------------------------|-----------------------------------|
| 1. Vendor data bases | 5. Planning & modeling | 9. Industry specialty application |
| 2. Program development | 6. Finance & accounting | 10. Other (specify) _____ |
| 3. Network consolidation | 7. Marketing & sales | _____ |
| 4. Raw computer time | 8. Scientific & engineering | _____ |

2. If you do not use outside services, are there any EDP functions or application processing you would consider contracting out?
A) ☐ Yes B) ☐ No
If yes, please specify _____

If no, why not? _____

3. Have you replaced or considered replacing any outside data processing service with an in-house minicomputer or microcomputer?
A) ☐ Yes, we have replaced.
Reason: _____
B) ☐ We have considered replacement.
Reason: _____
C) ☐ No, replacement has not occurred nor have we considered it.
4. Are you looking for application software to assist in implementing or developing new applications?
A) ☐ Yes B) ☐ No
If yes, which application areas? _____

If no, why not? _____

5. Have you considered or would you consider facilities management?
A) ☐ Yes B) ☐ No
6. Under which conditions might you consider facilities management? _____

INSTALLED HARDWARE

1. Please identify the major computers you have installed (equivalent of a 370/135 or larger).
- | | MANUFACTURER | MODEL NUMBER | QUANTITY | OPERATING SYSTEM |
|----|--------------|--------------|----------|------------------|
| A) | _____ | _____ | _____ | _____ |
| B) | _____ | _____ | _____ | _____ |
| C) | _____ | _____ | _____ | _____ |
2. Please identify the number of minicomputers installed (include small business computers and process control units).
0) ☐ None 1) ☐ 1-5 2) ☐ 5-10 3) ☐ 10-20 4) ☐ 20-50 5) ☐ 50-100 6) ☐ >100
A. Projected installation growth between 1977/78 A) _____% 1978/80 B) _____%
3. Major suppliers of your minicomputers:
- | | MANUFACTURER | MODEL NUMBER | QUANTITY |
|----|--------------|--------------|----------|
| A) | _____ | _____ | _____ |
| B) | _____ | _____ | _____ |
| C) | _____ | _____ | _____ |
4. How many terminals (total number) do you have installed?
0) ☐ None 1) ☐ 1-10 2) ☐ 10-50 3) ☐ 50-100 4) ☐ 100-500 5) ☐ >500
A. Projected installation growth between 1977/78 A) _____% 1978/80 B) _____%

EDP ISSUES

CODE NO.

U P 7 8 2

A. RCS Vendors Offering Hardware

1. A number of remote computing services (RCS) vendors are currently offering or plan to offer EDP hardware as an addition to these services:
- A. Are you aware of these offerings? A) ☐ Yes B) ☐ No
Please identify the RCS vendors _____
- B. Would you consider purchasing EDP hardware from an RCS vendor? A) ☐ Yes B) ☐ No
Please explain _____
- C. Have you made such a procurement or commitment? A) ☐ Yes B) ☐ No
If yes: Name of vendor _____
Estimated installation date _____

B. Financial Planning Services and Software

1. Please identify any financial planning services and software which you currently have installed:
Check here if none. ☐

NAME OF SOFTWARE PACKAGE OR SERVICE	CHECK ONE		NAME OF VENDOR	DATE INSTALLED	SATISFACTION LEVEL 1 = HIGH, 5 = LOW
	SOFTWARE PACKAGE	SERVICE			
A) _____	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
B) _____	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
C) _____	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
D) _____	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____

2. Are you currently evaluating a financial planning:
A) ☐ Product B) ☐ Service C) ☐ Neither
If yes, please identify the product(s) under evaluation: _____

C. Office of the Future

1. Please identify your involvement in the following relative to the office of the future, particularly as regards applications involving text/graphics, input/output, and retrieval.

TYPE	EDP INVOLVEMENT
Electronic Mail	A) <input type="checkbox"/> EDP involved now B) <input type="checkbox"/> EDP will be involved by the year _____ C) <input type="checkbox"/> EDP will not be involved by 1983
Word Processing	D) <input type="checkbox"/> EDP involved now E) <input type="checkbox"/> EDP will be involved by the year _____ F) <input type="checkbox"/> EDP will not be involved by 1983
Copying/Duplicating	G) <input type="checkbox"/> EDP involved now H) <input type="checkbox"/> EDP will be involved by the year _____ I) <input type="checkbox"/> EDP will not be involved by 1983
Data Communications	J) <input type="checkbox"/> EDP involved now K) <input type="checkbox"/> EDP will be involved by the year _____ L) <input type="checkbox"/> EDP will not be involved by 1983

TYPE	EDP INVOLVEMENT
Voice Communications	M) <input type="checkbox"/> EDP involved now N) <input type="checkbox"/> EDP will be involved by the year _____ O) <input type="checkbox"/> EDP will not be involved by 1983
Facsimile	P) <input type="checkbox"/> EDP involved now Q) <input type="checkbox"/> EDP will be involved by the year _____ R) <input type="checkbox"/> EDP will not be involved by 1983
Video Conferencing	S) <input type="checkbox"/> EDP involved now T) <input type="checkbox"/> EDP will be involved by the year _____ U) <input type="checkbox"/> EDP will not be involved by 1983
Other (Identify) _____	V) <input type="checkbox"/> EDP involved now W) <input type="checkbox"/> EDP will be involved by the year _____ X) <input type="checkbox"/> EDP will not be involved by 1983

D. Utilization Issues

1. What percent of your computer resources are used for:
- A) Production Runs _____ %
B) New applications development _____ %
C) Maintenance of existing programs _____ %
D) Other (Specify) _____ %
100 %
2. What percent of your application programmers are assigned to:
- A) Development of new programs _____ %
B) Maintenance of existing programs _____ %
C) Other (Specify) _____ %
100 %
3. What measures are you taking to reduce the time and costs associated with new applications development?

QUESTIONNAIRE D-3

CONFIDENTIAL

INPUT QUESTIONNAIRE

CATALOG NO. _____

STUDY TITLE: INFORMATION PROCESSING (EDP) PLANS

TYPE OF INTERVIEW: USER-EDP MANAGER

PURPOSE: This interview will investigate EDP plans and budgets, including data communications and the impact of current and coming economic conditions.

1. a) Please indicate the level of centralization of EDP control in your company:

_____ completely centralized

_____ partially centralized

_____ decentralized

- b) For centralization of processing, please indicate how many computer sites your company has/will have:

	1978	1980
Major (System 148 or larger)	_____	_____
Minor	_____	_____
Mini	_____	_____

2. What levels of growth are you using for EDP planning and budgeting purposes?

National 1978 _____ %

Industry 1978 _____ %

Company 1978 _____ % Company 1979-1983 _____ %

3. a) Based on these growth levels what will be the growth of the corporate EDP budget?

1978 to 1979 _____

1978 to 1983 _____

- b) What is the EDP budget per year? \$ _____
Please give as a percentage of sales if you can't give absolute figures. _____ %

4. What major objectives do you have for EDP.

... in 1978:

... in 1979:

... in 1980:

5. Please give the percentage change in expenditures from 1978 to 1979 for each of the following categories and items. Please comment on changes you expect.

a)	<u>Category</u>	<u>Decr.</u>	<u>No Change</u>	<u>Incr.</u>	<u>% Total EDP Budget</u>	<u>Comments</u>
	o EDP EQUIPMENT					
	-Main Computer Processors					
	-Secondary Computer Processors (satellites, Minis, Turnkey Systems)					
	-Peripherals					
	-Terminals					
	-Data Entry					
	-Other Equipment (Com, H.S. printers)					
	o PERSONNEL					
	-Systems & Program.					
	-Operations					
	-Administrative					
	o COMMUNICATIONS					
	-Data Communications (line costs)					
	-Data Comm. Equip. (controllers, Modems)					
	-Remote Terminals					

<u>Decr.</u>	<u>No</u> <u>Change</u>	<u>Incr.</u>	<u>% Total</u> <u>EDP Budget</u>	<u>Comments</u>
--------------	----------------------------	--------------	-------------------------------------	-----------------

o OTHER

-Supplies

-Utilities

-Other

b) For budget purposes are mainframe expenditures:

_____ monthly access charges	_____ outright purchase
_____ vendor lease	_____ depreciated purchase
_____ third party lease	

c) Of the following uses of terminals, please indicate which will be the most significant reasons for terminal acquisition over the next 3 years. (1 = most significant, 5 = least significant)

<u>Rank</u>	<u>Comment</u>
-------------	----------------

Source Input

Data Base Inquiry

Distributed Procssing

Interactive T/S

Remote Job Entry

Graphics

Other

d) Which was the most significant reason for terminal acquisition during the past three years?

6. Please indicate your company's level of use of outside services and software in 1978 and future changes you perceive.

<u>1978 Expenditures</u>	<u>suppliers/ \$ amount</u>	<u>% Change from '78 to '79</u>	<u>comment</u>
------------------------------	---------------------------------	-------------------------------------	----------------

SERVICES

- o Remote Computing
 - Timesharing
 - Remote Batch
 - Data Base
- o Facilities Management
- o Batch Svcs.
(overflow, COM Special Services)
- o Software Products
 - Systems (including DBMS)
 - Applications
- o Professional Services
 - Contract Prog.
 - EDP Consulting
 - Education
 - Other
- o Maintenance

7. To your knowledge, what departments or divisions in your company use remote computing or other services or have bought software?

<u>Department</u>	<u>Service</u>	<u>Amount</u>
-------------------	----------------	---------------

8. Does you EDP management have responsibility for:

	<u>Yes</u>	<u>No</u>	<u>Comment</u>
-All communications			
-Data communications only			
-Minicomputer/turnkey system purchases			
-Remote computing services purchases (timesharing)			
-Office computers			
-Other EDP Functions (such as COM)			
-Other non-EDP functions			

9. In each of the following areas please indicate the major software system used now and future changes you project?

<u>System</u>	<u>Change</u>	<u>Comment</u>
-Operating System		
-Network Software		
-Data Base Management System		
-Performance Measurement		
-Other Significant Software Development Aids		

10. a) What applications are most important in your development efforts?

Now

By 1980

b) Do you believe that the availability of proprietary applications products will influence new application installations in your company? ()Yes ()No

If yes, what are most significant areas?

c) Are you disposed toward sharing application programs within your industry? ()Yes ()No

11. a) What EDP functions or applications processing would you consider contracting out?

b) Would you consider a 'computer utility' as an alternative to in-house computers?

c) What is your attitude to using outside services and software?

d) Do you do comparison studies on the cost of outside services/software versus performing these functions in-houses?

12. Have you replaced or considered replacing any outside data processing service with an in-house minicomputer or microcomputer?
- a) ☐ Yes, we have replaced.
Reason:
- b) ☐ We have considered replacement.
Reason:
- c) ☐ No, replacement has not occurred nor have we considered it.
13. In network operations, what communications sources do you use now and how will this change in future?

%

Comment

-Standard Bell System

-Specialized Common Carrier

Satellite (AM Satellite)

Other (MCI)

-Value Added Carrier

(e.g., Telenet, Tymnet)

14. a) What do you consider to be the most important computer/com-
munications development in 1978?
15. a) What are the most significant EDP problems you would like to see
resolved?
- b) Do you see people-related problems (e.g. scarcity and productivity) as
being a deterrent to your plans? Why?

16. What is your involvement in distributed processing?
- a) () Distributed processing system is installed
 - b) () Currently implementing a distributed processing system
 - c) () Distributed processing is under consideration
 - d) () Distributed processing is not applicable to our business

How are you using or plan to use distributed processing?

Which vendor(s) is used?

Did a vendor participate in DDP system?

17. What percent of your computer resources are used for:
- | | |
|-------------------------------------|-------------|
| a) Production Runs | _____ % |
| b) New applications development | _____ % |
| c) Maintenance of existing programs | _____ % |
| d) Other (specify) _____ | _____ % |
| | <u>100%</u> |

What percent of your application programmers are assigned to:

a) Development of new programs	_____ %
b) Maintenance of existing programs	_____ %
c) Other (specify) _____	_____ %
	<u>100%</u>

What measures are you taking to reduce the time and costs associated with new applications development?

18. Please identify your involvement in the following relative to the office of the future, particularly as regards applications involving test/graphics, input/-output, and retrieval.

<u>Type</u>	<u>EDP Involvement</u>		
	<u>NOW</u>	<u>By</u> <u>YEAR</u>	<u>Not By</u> <u>1983</u>
Electronic Mail	()	()	()
Word Processing	()	()	()
Copying/Duplication	()	()	()
Data Communications	()	()	()
Voice Communications	()	()	()
Facsimile	()	()	()
Video Conferencing	()	()	()
Other (identify) _____	()	()	()

19. What information would be useful for you to know for your EDP planning in the future?

20. a) Do you have a corporate or departmental technology planning function which monitors and analyzes computer/communications developments?

- b) Is the analysis freely disseminated throughout the EDP Department?

QUESTIONNAIRE D-4

CONFIDENTIAL

INPUT QUESTIONNAIRE

CATALOG NO. _____

STUDY TITLE: 1978 User Planning Service - Annual Report

TYPE OF INTERVIEW: User Executive - Telephone & Site

PURPOSE: The purpose of this interview is to investigate corporate and financial management objectives and plans for, and concerns about, information processing (EDP) and communications.

1. How do you view your industry growth in 1978 and 1979? What will be your company's participation in this growth?

2. Is the role of EDP in accomplishing this growth:

Major _____ Medium _____ Minor _____

3. a) Please rank the importance of EDP in corporate considerations:

Top priority _____ Very important _____

Important _____ Less important _____

b) Do computer/communications systems provide your company with competitive advantages?

4. What top management concerns are there about computer or communications developments or activities? Now?

Next five years to ten years?

5. What is the most important thing you require from your EDP function?

6. Please rank and comment on the importance of the following factors related to computer/communications use. (1=unimportant, 10=critical)

<u>Factor</u>	<u>Rank</u>	<u>Comment</u>
Cost of EDP - Hardware		
Cost of EDP - Software		
-Application Packages		
-System Packages		
-Development		
-Maintenance		
People Availability and Productivity		
Distributed Processing		
Technology Developments		
Security of data		
Use of Minicomputers/ Micro-computers		
Use of Computers in the office		
New Communications Services		
Other		

7. What objectives have you set for your computer/communications functions?

8. a) Have your EDP budget plans been satisfied from 1977 to 1978?

Higher _____ Lower _____ On Budget _____

Comments?

8. b) What will be the growth of the corporate EDP budget from:

1978 to 1979 _____ %

1978 to 1983 _____ %

9. In 1975 many organizations, because of the recession, placed restrictions on EDP. Generally these have been removed. With talk of a recession in 1979, is your firm considering re-imposing EDP restrictions?

10. What is your attitude to using outside computer services instead of, or as well as, internal EDP?

